DEATH VALLEY

BOURKE LEE

DEATH VALLEY

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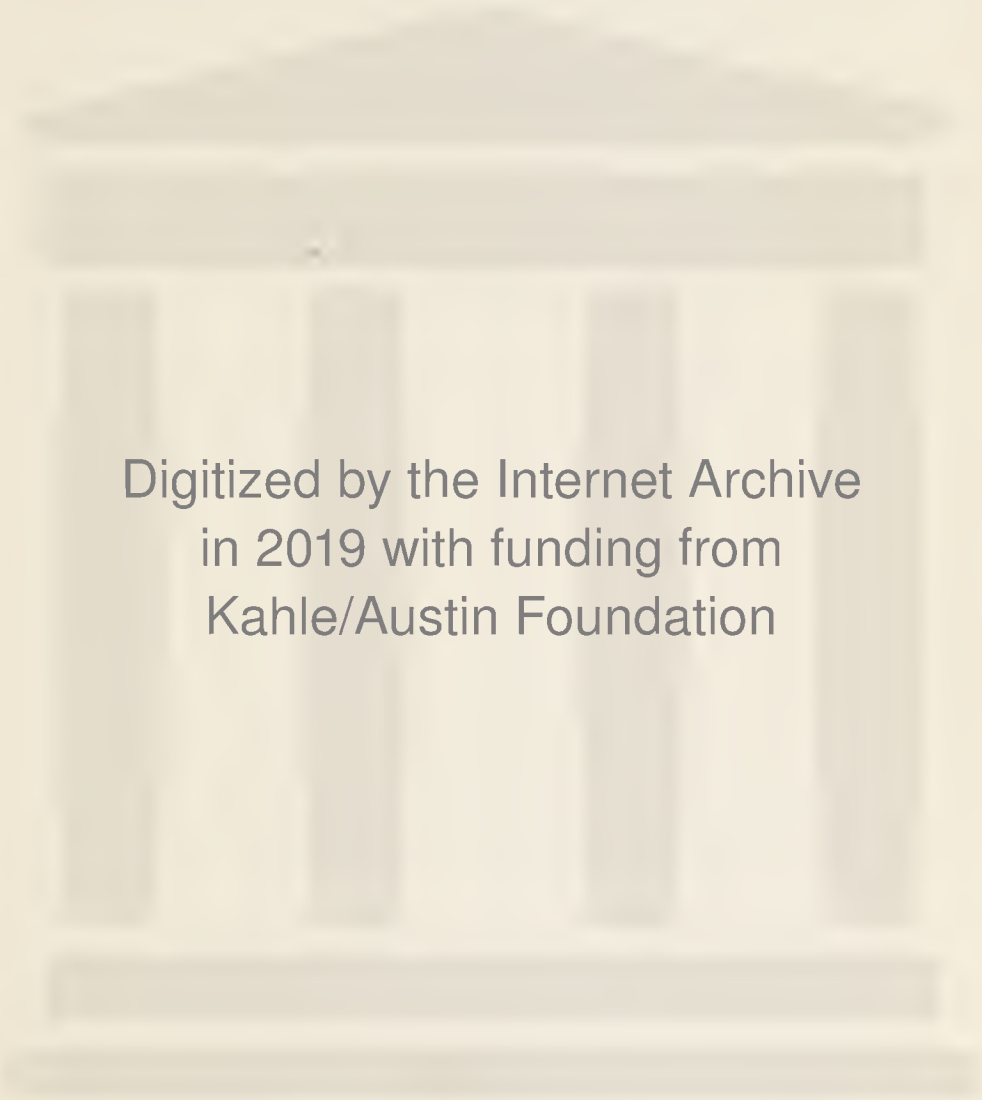

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DEATH VALLEY AND TELESCOPE PEAK FROM THE MOUTH OF GOLDEN CAÑON

DEATH VALLEY

BY

BOURKE LEE

This story of Death Valley includes the geologic history of the valley and a survey of its plant and animal life, but the bulk of the tale is about men—Indians, emigrants, and miners,—who have known the Death Valley trails.

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CONTENTS

CHAPTER ONE

PAGE

SUN AND SCENERY 3

CHAPTER TWO

EARLY INHABITANTS 29

CHAPTER THREE

PAIUTE LORE 55

CHAPTER FOUR

LOST EMIGRANTS 89

CHAPTER FIVE

MINES AND MINERS 125

CHAPTER SIX

PLANTS AND ANIMALS 161

CHAPTER SEVEN

GEOLOGICALLY SPEAKING 185

BIBLIOGRAPHY 209

ILLUSTRATIONS

Death Valley and Telescope Peak from the mouth of Golden Cañon . . . . . *Frontispiece*

FACING PAGE

Twenty-mule team borax wagons on the Amargosa Desert in the Eighties 4

Borax wagons and water tankwagon at Furnace Creek Ranch . 12

Stovepipe Well is a hole in the sand 18

The cornfield 24

Death Valley and the Panamints from Zabriskie Point . . . 32

The wind-swept sand of Lost Valley 40

Narrow-gauge gasoline car en route to eastern edge of Death Valley and Furnace Creek 46

Lost Valley from Tucki Mountain 50

Telescope Peak from the Funerals 56

Yellow Hills near Furnace Creek 62

Lost Valley and the Amargosa Range 72

The Amargosa Desert and the Bullfrog Hills 78

Winter sunrise in Death Valley 82

The Bottle House of Rhyolite, Nevada 92

The salt bed 98

A cañon gate into the Panamint Range 108

Death Valley and the Panamint Range from Furnace Creek Wash 114

Grapevine Mountains from the sand dunes 120

Ryan, California. Borax headquarters on the eastern edge of Death Valley 126

Rhyolite and the Bullfrog Hills 132

Death Valley's first tractor in Daylight Pass 140

Entrance to Indian Cañon 148

PAGE

Old Harmony Borax Works and Funeral Mountains 154
Borax flat near Salt Creek crossing 162
The sink of Death Valley 168
Mesquite and creosote-bush in the dunes of Lost Valley . . . 174
Furnace Creek ranch on the Death Valley floor 180
Grotto Cañon in Tucki Mountain 186
Along the road through Furnace Creek Cañon 194
Sunset over the Panamint Range 198
Shadows flood the sand hollows 204

SUN AND SCENERY

A man and his wife and their daughter drove in to see Death Valley. They came in from Nevada through Hell's Gate and drove south toward Furnace Creek. They camped over night in a mesquite thicket on the valley floor. It was January and the nights were cold. At daylight the campers were cold and unhappy in their thin khaki breeches and light shirts. They rustled wood and pottered around a fire getting coffee. A prospector came along the road in his battered car and stopped when the woman waved imperiously. The woman went over to him and complained.

She said, "Say, I've been hearing about Death Valley all my life and I always heard that it was the hottest place on the face of the earth. Why we haven't been able to keep warm! Yesterday there was snow in the pass and last night we almost froze to death. We only brought three blankets because we expected to burn up in here. We've been shivering for two whole days. Who started all these stories about Death Valley being such an awful hot place?" She seemed to suspect the prospector.

"In the summer she's plenty warm," he said.

"Oh, it is, is it? How warm does it get?"

"Warm enough. I remember comen through here 'bout twenty year ago. I had my boorows loaded with bags a corn. It was in July, lady, and the valley was so hot that the corn started poppen and all the bags busted open. That corn scattered all over and kept on poppen until they was a big pile a white popcorn all around me. My fool boorows thought them white heaps was snow and they laid down in the sand and froze to death."

CHAPTER ONE

SUN AND SCENERY

AMERICANS have been hearing about Death Valley since 1850. They have heard a number of things and they have acquired vague ideas of the valley's location, structure, and history. A variety of very definite impressions has convinced almost every one that Death Valley is a freak of nature. During the rush to the gold fields of California in 1849 a party of emigrants strayed into Death Valley and all the emigrants died there. That was probably where Death Valley got its name. Borax came from Death Valley with pictures of mule teams on the box. Mules were the only things that could live in the infernal heat of the valley. Death Valley was the hottest place in the world. It was so far below sea level that the air was thick and hard to breathe. There was no animal life or vegetation in the valley and the water was all either salt or poisonous. Deadly gases filled the sand pockets of the valley. Terrible sand storms swept through it. Foolhardy adventurers had been swallowed by the quicksands of the bottomless salt marshes. No one entered Death Valley intentionally except the crazy prospector. There were bones of prospectors all over the valley.

Only one person seemed to have conquered Death Valley. Death Valley Scotty. Scotty came out of the valley every once in a while with his pockets full of gold. He had a secret mine. He hired special trains to take him to Chicago or New York.

When Scotty came to town he threw money out of the window of his hotel and tied up traffic. Scotty was a mystery. His mine was a secret between himself and his mule. How Scotty avoided the deadly vapors of Death Valley, its quicksands, and its terrors of thirst and terrific heat, was also a mystery. Scotty and his mule and Death Valley guarded their secrets well. Death Valley was well named. Nobody went there. It was a good place to stay away from.

There is truth in this popular conception of Death Valley. There is also error.

Scotty has not been the only one to know Death Valley. There were Indians living in the valley thousands of years before Scotty began hiring special trains. Two hundred years ago the Spaniards were working silver mines in the valley mountains. Eighty years ago one party of Forty-niners struggled through the Death Valley region. Not all of these emigrants died. Most of them lived to write a book about the terrors of the valley. In the early seventies, the miners began to plunder the mineral wealth of the valley. They mined gold, silver, copper, zinc, and lead. They recovered borax. Gem hunters have been crawling over the valley hills for forty years. Boom mining towns have sprung to life and lived and died on the borders of the valley. In 1906 over a thousand people living in Skidoo in the Panamint Mountains could look east through Skidoo Gap down into the deadly pit of Death Valley. They could see the freighters bringing their wagons along the old trail from Bullfrog that crossed Death Valley near the sand dunes. The freighters and their mules made regular trips across the valley. There was a good market for whisky and fresh vegetables in Death Valley in 1906.

Rhyolite in Nevada just east of the valley was the big boom town of the Death Valley region. It had eight thousand resi-

Photo by Stephen H. Willard

TWENTY-MULE TEAM BORAX WAGONS ON THE AMARGOSA DESERT IN THE EIGHTIES

dents in 1907. Rhyolite started out to be a modern town with three railroads, concrete buildings, electric light, and plenty of saloons and a big line down in the hollow back of town. Charley Schwab took a million out of the Montgomery-Shoshone Mine in Rhyolite. A million in gold. Most of the other mine companies just blocked out the ore and sold a million dollars worth of stock. The panic of 1907 killed Rhyolite. There is not much left of it to-day. The skeletons of the concrete buildings stand along the wreck of Golden Street behind the sagging telephone poles. The windows and roofs are gone from the buildings and almost all the floors are in the cellars. There is one small house made entirely from bottles piled neck to neck and cemented with adobe. Bill Corcoran says that Rhyolite was some town while she lasted.

Tourists driving their cars through Death Valley go over to Rhyolite and register in the Bottle House if they have time. Rhyolite is a side trip on the tour through the valley and the valley roads are so rough that the tourists are usually behind schedule. The tourist looks at his map and says, "Seventy miles, over and back; that'll take us two hours." And then it takes him two hours and a half to go one way. If it is a warm day in the spring or fall, his car will boil going over the mountains and unless he has plenty of water with him he loses more time waiting for some one to come along. His schedule for the day is all shot to pieces. His family suffers, too.

Spring and fall are the times to visit Death Valley. No one who is wise enters the valley in the summer. The valley is hot in the summer. It gets hot in the later part of April and stays hot until the middle of October. From December until March the valley is cold, cold enough for warm clothes and extra blankets. The fabulous valley of death is best visited from November until May. In April the flowers bloom.

Death Valley of sinister reputation has a tourist season. The somber valley is on the highway of the world. Its silence is shattered by the distant thud of some miner burning powder in the hills and the closer chatter of an automobile or tourist complaining about the roads. Fear of the valley has been replaced by admiration for its rugged grandeur. Once infamous for the perils of thirst and death that stalked its trails, Death Valley becomes famous for its mad beauty. Artists strive to fix the living colors of its depths in passive oils, imprisoning two mighty mountain ranges and a great desert valley on a three-foot square of canvas. Death Valley becomes part of the America that should be seen first. There are hotels and gasoline stations in Death Valley. Soon there will be hot dog stands. But they will not hurt the hills.

Death Valley is in southeastern California. It is part of the Great Basin of the Great American Desert. The Great Basin is an astonishing arid trough spread over two hundred and nine thousand square miles of Oregon, California, Nevada, and Utah. There are thousands of streams within the Great Basin but not one of them ever reaches the sea. The Great Basin is the land where the rivers are upside down with the stream bed on top and the water beneath the sand and gravel. The Great Basin has been a thirsty land through the ages. For millions of years the Great Basin has been drinking the water of all the rain or snow deposited upon its higher ridges. For millions of years every rain storm and snow squall on the upper levels of the Great Basin have sent water pouring down the steep mountains into the burning desert valleys. The plunging waters have cut deep, twisting cañons in the ranges and worn away the minor foothills and mesa lands. The waters have reduced high ranges to insignificant low divides,—through millions of years. But the the thirst of the Great Basin is

unslaked. Death Valley, the deepest trough of the Great Basin, burns with insatiable thirst.

In past ages water wore down many mountain masses in the Great Basin. Then other powers remolded the land that water had worn away. The land was picked up and thrown high in the air. Its rocks were melted and twisted into new ranges. The new ranges were tied in knots to create new mountains. Volcanoes domed the mountains. Earthquakes tumbled the uplifted land masses about. Great faults and slips sliced through the mountain structures and unsupported sections of the ranges settled into place. The reconstructed land was sprayed with colors. Colors of purist, modernist and futurist. Not fixed colors. Not quiet, unmoving tones. Jeweler's colors. The gem colors of rock that is alive and changes its hue with the light. There are two hundred and nine thousand square miles of color in the Great Basin. Death Valley, in the southern portion of the Great Basin, rests in the deepest setting.

People live in the fertile regions to east and west of the Great Basin. They call the southern part of the Great Basin the desert. In this word desert they embrace seventy thousand square miles of desert. They include three distinct deserts; the Colorado Desert, the Mojave Desert, and the Death Valley region. Each of these deserts has a main drainage way through which an intermittent stream flows. The stream bed is dry along the greater part of its course, but through it and under it the water finds a way downward from the hills into a series of central troughs that are scattered throughout each desert.

The floors of all three deserts contain many sinks. The sinks are called dry lakes, borax flats, alkali washes, or salt sinks. The sinks receive all the water that drains from the higher regions about them and as the sinks have no outlets each desert

sink becomes either a lake or a playa. If the sink is a lake, it is usually so rich in salt, sodium carbonate, potassium sulphate and other chemicals that it is a mine rather than a lake. The chemically scarred borders of the desert lakes are shunned by all animals except man. Man suffers their bitterness to extract the wealth they hold.

The playas are formed by the evaporation of water that drains into the sinks from the surrounding hills. Throughout the greater part of the year the playas are level, sunbaked expanses of clay. They are bare of vegetation because even hardy desert growths cannot survive intermittent floods, constant accretions of mud, and excessive deposits of alkali. After a heavy rain in the hills, a playa becomes a morass covered with a slick of water. Many of the playas are dotted with miners' monuments which mark the limits of niter, potash or borax claims. The miners are all in town trying to sell their claims.

The three great deserts, the Colorado, the Mojave, and Death Valley, which comprise the southern end of the Great Basin, are grouped along a northwest southeast line. The Colorado Desert begins at San Gorgonio Pass, the natural cut in the San Bernardino Mountains through which the Southern Pacific Railroad reaches the Pacific coast. The Colorado Desert winds around the southern shoulder of the San Bernardino Mountains and the northern spur of the San Jacinto Mountains, and stretches southward through the Salton Sink, through the irrigated abundance of Imperial Valley, through the rugged foothills of Mexico to the Gulf of California.

North of the Colorado Desert is the Mojave Desert. North of the walls of the San Bernardino, Cottonwood, Chuckwalla and Chocolate Mountains, the gaunt waste of the Mojave extends northward to the barrier of low, broken hills that runs east and west between Silurian Lake and Silver Lake. Across

this low divide is the southern gate to Death Valley. Death Valley stretches northwestward from the gate with a high, gnarled mountain range on each side. The Panamint Range is on the west side of Death Valley. The Amargosa Range, with its Black, Funeral, and Grapevine Mountains, is on the east. The ranges are from four to ten miles apart, and from five to eleven thousand feet high. Between the ranges is the deep depression of Death Valley, one hundred and twenty miles long.

Death Valley is the sink of the Amargosa River, which meanders down through the Amargosa Desert east of the Amargosa Range. At the south end of the Black Mountains the Amargosa River forks. One short fork drains south and the other fork runs north into the sink of Death Valley. Most of the valley is below sea level. At the salt pools the sink is over three hundred feet below sea level. Six thousand feet above the salt pools is Dante's View in the Black Mountains. Just west, across the valley from Dante's View, the snowcap of Telescope Peak rises to over eleven thousand feet and presents the greatest vertical profile of any mountain in the states. Automobiles drive up to Dante's View and people admire the mountains and the strange lights in the deep valley. The sides of the Black Mountains are cluttered with adjectives that have spilled over the cliff at Dante's View. Artists paint and cameras click on Dante's View. It is a popular exclamation point.

The higher crests of the Amargosa and Panamint Ranges command a weird, unearthly land. Spread out below them ten thousand square miles of tortured desert and wrinkled desert ranges suffer in the sun. To the westward, the mottled patchwork of burned reds and browns ends eighty miles away, where the high Sierra Nevada Range lifts its snow-clad backbone to build a jagged horizon in the sky and end the westward march

of the desert. In all other directions the weathered ribs of the mountains and minor hills break darkly through the background of the patterned yellow and scorched-orange desert. The land runs away to merge with the gray and violet distance. The clouds screen the sunlight. The haze of heat filters the sunlight. Through clouds and heat haze the sun floods the naked land with molten steel. In the narrow pit of Death Valley the salt marsh glows dully white in the pulsing lights and moving shadows. Gaudy mineral stains streak the mountains. At sunset the colors leap from the land into the sky. The screaming sunsets are impossible. There are no such colors.

The floor of Death Valley is harsh and barren. Near Furnace Creek it is occupied by a great bed of salt that is forty miles long and several wide. The entire surface of the ground is crystalline salt many feet thick. Bizarre pillars of salt rise several feet above the surface. The salt crust has cracked and broken up into hard slabs of solid salt. These natural blocks of salt were beaten down with sledge hammers to make a road through the salt bed. The road forks in the salt bed and the east fork runs into the salt pools. The west fork leads out through the south end of the valley. The road south carries very little traffic. People get discouraged driving through the salt bed and turn back to take the road which leaves the valley through Furnace Creek Cañon.

Legend says that many years ago there was a smelter at a mine in Furnace Creek Cañon. Furnace Creek was named because of that furnace, not because of the heat. There is plenty of good water in Furnace Creek. The hotel at the Death Valley end of Furnace Creek uses the water for its swimming pool, and Furnace Creek Ranch down on the floor of the valley is irrigated by the water of the creek. The ranch grows alfalfa

and dates and raises turkeys and chickens. Turkeys do very well in Death Valley. The dates grown on the ranch are blight-free. The date palms were clean when they were first brought to the valley and the isolation of the valley has kept them clean.

Furnace Creek Ranch was started in the seventies by a gentleman who wanted privacy. It was later taken over by Borax Smith, who operated the Old Harmony Borax Works, just north of the ranch, from 1883 to 1887. The borax was recovered from the water in the marsh of Death Valley. The ruins of the evaporation vats lie beside the old road that runs north from Furnace Creek. Old wagon tires and equipment are scattered about the ruins of the adobe huts at the old borax works. Two of the old borax wagons and a watertank wagon stand outside the fence at the ranch. They are too big to make good souvenirs.

The borax company hauled borax south out of Death Valley with the famous strings of twenty-mule teams. Those mule teams advertised Death Valley in many homes. The company improved Furnace Creek Ranch so that there would be some shade in Death Valley. It had plenty of water and grew hay for the mules. The mule teams hauled two borax wagons and a tank wagon on the trips to the railhead. A round trip required about thirty days. They made about twenty miles a day and laid over a day or so at each end of the trip.

Joe Salsuepuedes worked for Borax Smith in the eighties when the Old Harmony Works were running. Joe's life in Death Valley is described by Mr. David Andrew Hufford in his collection of "Swamper Ike's Traditional Lore." Joe went into Death Valley in the fifties. Joe was a baby then. He was with his father and mother who were crossing the desert to California in a prairie schooner. In Death Valley, near the

base of Telescope Peak, Joe's people ran out of water. Joe was very thirsty and very fretful. His father went out into the valley looking for water. He did not come back. Joe's mother gave baby Joe the last drop of water and left Joe to go in search of the father. Joe was rescued by a small band of Cocopah Indians traveling east to the Colorado River. The Indians told Joe later that they had sat up on the hill and watched his father and mother wander off. They were afraid to come near. The Indians raised Joe as one of their tribe. They named him Salsuepuedes. Salsuepuedes is Cocopah talk for Get-Out-If-You-Can.

Thirty years later Joe returned to Death Valley and went to work at the Old Harmony Borax Works. Joe was a teamster's helper. The freighters called a teamster's helper a swamper. The other men at the borax works could not pronounce Salsuepuedes. And besides Joe Salsuepuedes did not look like a Joe. So they called him Swamper Ike.

Ike made seventy-five dollars a month and found while he was a swamper. When he learned to handle the sixteen-mule teams, Ike became a teamster. The teamsters handled their long string of mules with a single line. A jerk line. They were clever drivers. They were paid one hundred and twenty dollars a month. That was good pay in 1885. Driving sixteen or eighteen or twenty mules through Death Valley was worth one hundred and twenty dollars a month even in 1885. Quite a number of teamsters were found dead along the road. Usually they died from natural causes. Heat. Exhaustion. Heart failure. In the hot weather Death Valley is a very poor place to get drunk.

Going north in the valley from the Old Harmony Borax Works, the floor of the valley rises. The road runs across the gray-blue gravel fans that pour down from the mouth of every

Photo by Walter Fiss

BORAX WAGONS AND WATER TANKWAGON AT FURNACE CREEK RANCH

cañon in the mountains. There are sulphur-colored hills. Red and green hills of clay. Crystalline salt sparkles through its dun coat of sand. The dead white of borax and niter out on the flat in the center of the valley shows in irregular stretches through the rusty growth of the salt grass that likes its water bitter. Traveling through the valley, the carved and barren mountains are always close definite horizons on the east and west. Northern and southern horizons in the valley are vague in a haze that may be lavender, fawn or blinding white.

North of the salt bed, the Salt Creek road forks to the west through soft, tawny sand to the Salt Creek Crossing. The creek is a miniature stream flowing south through the heavy salt crust. The water of the creek is a clear salt-saturated solution. The Indians claim that just below the crossing there is a strong spring of sweet water that wells up from the bottom of the creek and boils up to the surface of the bitter creek. The spring is a fountain which just breaks the surface. I have never been able to find that fountain.

Further north the Salt Creek road winds over great heaps of lake shore rubble. The pebbles that were washed by the waves of the ancient lake are almost round. The sun has burned the rubble black, and coated the rocks with the smooth and glistening desert varnish. In certain lights the jet black rock fragments sparkle and dress entire bronze slopes in spangles.

The Cornfield, where the Jayhawker emigrant party made a last Death Valley camp in 1849, is close to the Salt Creek road between Tucki Mountain and the sand dunes. The Cornfield is a borax flat studded with desert shrubs. The wind sweeps the Cornfield and tears the surface soil away from the roots of the shrubs, so that the shrubs resemble shocks of corn. Relics of the Jayhawker party have been recovered from the Cornfield. An ox-yoke. A wagon hub. A rusted chain. These

relics hang in the store at the toll gate on the private road which sweeps up Emigrant Wash and crosses the Panamint Range through Townsend Pass. A freighter's wagon stands on the gravel fan close to the valley end of the toll road at the foot of Tucki Mountain. The wagon was rescued from the sand at Lost Wagons near the north end of the valley. Visitors to the desert resort at the foot of Tucki Mountain have their pictures taken at the wagon.

The road across the Panamints is a brave piece of work. From the foot of Tucki Mountain it runs east across the valley, passing the sand dunes and Stovepipe Well. Stovepipe Well is a hole in the sand on the east side of Death Valley at the feet of the Death Valley Buttes. When freighters were making regular trips across the valley during the mining boom, men and stock got water at Stovepipe Well. The well was hard to find until some one thrust a short piece of stovepipe into the sand to mark the well. Very thirsty men got water at the well. Stovepipe Well is a point of interest to the tourists. They take pictures there. Sometimes they taste the water.

Across the road from the well is the Bottle Dugout. Two-thirds of the dugout is under ground. In hot weather, the valley is cooler below the surface. The Bottle Dugout is a curiosity. It was a saloon in the days of the freighters. The freighters crossing the valley on the old Bullfrog Trail stopped at Stovepipe Well and helped to empty the bottles that went into the walls of the Bottle Dugout.

The Bottle Dugout is a good place to camp on a cold night. I helped a bundle-stiff find the dugout one November night. He was cold as he stood beside the car and asked me about the dugout. He had walked across the desert from Darwin. He had walked fifty miles across the Argus Mountains, Panamint Valley, Panamint Mountains and Death Valley. He thought the

dugout would be a good place to sleep, if he could find it. He had a can of beans and a bottle of water. The next day he was going east to Beatty. I told him it was thirty-five miles. Up the Amargosa Range. Through Hell's Gate and Daylight Pass into Nevada. Down the Amargosa Range and across the Amargosa Desert. Through the Bullfrog Hills, past the ruins of Bullfrog and Rhyolite into Beatty. He thought there might be a job in Beatty. There has not been a job in Beatty since 1907.

The sand dunes send their feathered edges into Stovepipe Well and the Bottle Dugout. The sand dunes soften the ferocity of the valley's weird composition of sharp angles. The wind has swept the sand into perfection of simple line and curve. The shadows of the graceful dunes flood the sand hollows with dark liquid. The sand dunes seem to be asleep all through the winter, but in the summer they awake and move. They may move fifty feet. They may move two hundred. Death Valley is not a pleasant place when fifty square miles of sand dunes stir and hang a swirling curtain of hot sand from the sky.

Death Valley has its sand storms all the year round. In the winter months there is a sand storm about once a month. In the summer months, from May to October, there is a sand storm almost once a week. Summer temperatures in the valley go to one hundred and thirty and above. The wind blows so hard that a man cannot stand up against it. The hot wind, loaded with hot sand, sweeps through the burning valley and the vivid colors of the hills are blotted out by the opaque yellow of the sand blast. A sand storm may die down within a few hours or the scourge of sand may last for days. Men and animals have died in the hot sand blasts. Bill Corcoran says that a summer sand storm turns the valley into a pot of boiling glue.

A winter sand storm is an unpleasant, gritty experience. A summer sand storm is hell on wheels.

The Paiute Indians who used to live in the Death Valley region called the valley *Tomesha*—ground afire. The Paiutes were talking about the valley in July and August. The government records show temperatures of one hundred and thirty-eight in July. A Mexican named Vic had charge of recording the temperatures of the valley for the government for several years. Vic lived at Furnace Creek Ranch. I was looking over the temperature records one day. There was a spell of weather one July and the thermometer hit one hundred and twenty-five almost every day for two weeks. At three in the morning it cooled off to one hundred and five. Those were the temperatures in a covered, louvered box, protected from radiation. Shade temperatures. It must have been one hundred and forty in the sun. I asked, "How did you stand that heat, Vic?"

Vic looked at the record sheet. "That was hot," he said. "I remember. I almost die. Hot, hot, hot, every day. No sleep at night. My dog lie down in the creek and try to catch his breath. I send my wife out of the valley. My burros go up in the hills. My head begin to feel funny. I think maybe I stay in this damn valley too long. I lie down by my dog in the creek. Hot water! I think, what the hell? My burros got good sense. They go up in the hills. My dog stay because I am damn fool and stay. That night I say to hell with this! Me and my dog go up the cañon."

The summer heat and glare of Death Valley are dangerous. Desert men avoid the valley during the daylight hours. They know that men have died on the valley floor in the summer heat. Not all of them died from lack of water. Men have been found with canteens almost full. The human system does not seem to be able to absorb moisture as fast as the dry, hot

valley air draws moisture through the pores. There is no moist rot or decay in the valley or its hills. The trees on the higher mountains, which die, become dry seasoned where they stand. Men and animals die in the sun to become mummies and then dust.

Tomesha. Ground afire. Well said, Paiute!

Cloudbursts have carved hundreds of grotesque cañons in the Death Valley mountains. The roaring floods pour down the mountains, boom through the cañons and spread out over the giant fans of gravel at the cañon mouths. The cloudbursts occur infrequently and usually have few spectators, because few people remain to enjoy the spectacle. When a cloudburst starts to form almost every one seems to yearn for other scenes. But there is no danger except in restricted cañons and there is always plenty of warning. The cloudburst begins as a great black cloud dimming the sun. The cloud sweeps toward a mountain. An hour passes. Long tendrils reach down from the cloud mass and grasp the mountain. The cloud sits down upon the mountain and rain pours upon the uplands. Thousands of waterfalls burst from the sheer flanks of the hills and the cañons are alive with rushing water. The valley silence is gone. There is the crash of water. The road across the gravel fan below Poison Spring disappears beneath a rumbling sheet of water. The county road gang just got through working on that stretch of road and the road crew will not be back until next year.

The mountain ranges on each side of Death Valley are cut by deep cañons. From the floor of the valley the way into these cañons lies up the slope of the alluvial fans of boulders and gravel. Often it is a five-mile climb up the fan from the valley floor to the cañon, twenty-five hundred feet above. Erosional forces have disintegrated the mountains and poured

the refuse through the cañons to form the alluvial slopes. The fans from adjacent cañons meet and overlap, and old trails along the upper edges of the alluvium join the cañons together. Many of the cañons are unnamed and almost unexplored. Others have borne names for a long time; Gower's Gulch, Sheep Cañon, Death Valley Cañon, Titus Cañon. Old Indian trails run through Cottonwood and Marble Cañons—through Titus and Furnace Creek Cañon. There are Indian writings on the walls of the old cañons through which the ancient trails run. It is in the cañons that the remote spirit of Death Valley dwells. The ignorant Indian savage knew that. But the white man is just finding it out.

The geologist and ethnologist are interested in Death Valley. The ethnologist is digging in the cañons for traces of the earlier man. The geologist is scampering over the mountains, piecing together the story of the valley's creation. Little by little the scientist is reconstructing the history of the valley. When his collection of specimens and horrific scientific terms is complete, the man of science will have proved a tale the Indians have been telling each other for a thousand years. The Indians know all about the creation of Death Valley. It was an affair between themselves and their gods.

The Indians admit that they were to blame for the havoc wrought with the land in the region. The Buzzard warned them. The Mountain Sheep warned them. All their gods warned them. The medicine men told them that the gods were out of patience with the tribes, weary of the wars among Panamint, Californian, Mojave and Paiute. It was high time to stop the raids of brother upon brother. There must be an end to brother killing brother. The gods promised that unless the Indians stopped their murderous quarreling, the gods themselves would stop it in their own terrible fashion.

Photo by Walter Fiss

STOVEPIPE WELL IS A HOLE IN THE SAND

The counsels of the medicine men and the warnings of the gods went unheeded. The tribal bickering and intertribal raiding and plundering continued. The killings went unchecked until the gods stepped in. They punished the disobedient and rebellious Indians in terrible and godly fashion. They blew off the tops of the mountains and poured molten rock upon the warriors. The warring tribes fled blindly. The earth turned to jelly beneath them. It trembled and shook and ran in ripples under their flying feet. Great rents appeared in the earth and cut off all escape. The gods split a mountain chain open and poured an ocean of water through the gap. What is now Death Valley became an inland sea.

By this time the gods were interested in their work. They loaded the waters of the inland sea with salt and then dried the waters up. They tossed the mountains around in liquid form and solidified them with vertical rivers dropped from the sky. When the cooling waters washed away a mountain range another was thrust up to take its place. The new range was twisted, split, and stood on end. At length, the gods thought that the Indians had been punished enough. Besides, the gods were getting tired. So they stopped the torrential rains, took all the moisture from the air and left Death Valley to slip and settle into its present form.

That is the Indian version of the creation of the Death Valley region. The scientist objects to the legend because he can prove that there were no Indians on earth when Death Valley was formed. The scientist says that Death Valley is about twelve million years old. The valley may be geologically young, but it is some ten or eleven million years older than man. The scientist insists that the Indians must have arrived in the Death Valley region a little late for the scenic effects which accompanied the earth's first movements as it began to

shape the valley into its present brutal form. But the geologist arrived even later. He missed even the last act that the Indians describe.

The geologist must toil through the crinkled ranges and study the quartzites and limestones, the schists and granites, and the lake beds in the hills. He must probe the lake beds for their fossils and investigate intruding lava flows. He must relate the rocks revealed in well borings and mine shafts to similar rocks crowning the surrounding hills. Slowly, and with great wealth of detail, the geologist reconstructs the history of Death Valley. The completed story of the geologist substantiates the Indian tale. Both tribes, Scientist and Indian, are agreed upon the volcanoes, the floods, the ancient lakes, and the earthquakes. The Indian could not possibly have been there when the earth was in labor. But in the mysterious way of the primitive the Indian knew all about it.

There are still some Indians in Death Valley. They are Paiute Indians, members of a tribe that was part of the great Shoshonean Indian nation. Within recent years a number of Paiutes camped at Furnace Creek Ranch every winter. There was a school for the Indian children at the ranch and a small playground with swings and a slide. Tin cans are heaped by the road where the Indians camped. A few Paiutes continue to go to the ranch in the winter but most of the valley Indians now work up at Death Valley Scotty's place.

Scotty lives in Grapevine Cañon, near the north end of the valley. His ranch is the old Stanniger Ranch and Scotty has all the water he needs to grow quantities of grapes and melons and a number of fruits. Scotty puts up wonderful preserves.

Scotty has a Chicago capitalist for a partner. They decided that they needed a new house in the valley. The new house developed into an elaborate establishment that cost a million

dollars. They had the house almost finished twice, but neither time did the house shape up the way they expected it to. They tore it down and built it over again. An architect and forty men worked steadily for three years. Wood carvers came from Austria to ornament the doors and interior trim. The tiles on Scotty's new kitchen came halfway around the world. Scotty says that the new kitchen is too damn fancy.

A high pressure fire fighting system and a pipe organ are among the features of Scotty's new house. A pipe organ in Death Valley is something of a problem. The extreme heat and dryness splits the reeds. An organ with split reeds makes strange and horrible noises.

Death Valley Scotty is Mr. Walter Scott. He is Death Valley's original and best press agent. He is one of the mysteries of the valley. People think of Scotty as a man who comes to town in a blue shirt with a red necktie and an old battered hat to hire special trains and throw money around. People are curious where Scotty gets all the money he has been spending for twenty years. They are so curious about Scotty and his money that when some one points out Scotty to them they frequently walk right up to Scotty and say, "Are you Death Valley Scotty? Well, tell me something. Where do you get your money?"

Scotty is a fine, hospitable fellow. Whenever any stranger asks him where he gets his money, Scotty usually explains. Scotty can tell wonderful yarns.

A few years ago a little old lady from New Hampshire made the long trip into Death Valley. She was a thin little thing, dressed in black with a black bonnet perched upon her head. She had been hearing about Death Valley for a great many years and she was tremendously interested in Scotty. No one could tell her enough about Scotty's history, so she decided to

visit Scotty herself. That little lady had a mind of her own. She could not be convinced that the hundred miles of rough roads on the trip to Scotty's would be too much for her. She went to see Scotty. I saw her after she made the trip. She was all smiles. Scotty had made her welcome and entertained her with stories of the old valley and the boom camps. She had dinner with Scotty and heard all about Scotty's escape from slow and sudden death in the valley heat and at the hands of bandits who tried to trail him through the hills.

"Did he tell you where he got his money?" I asked.

"Oh, yes," she said, bobbing her head. "He answered every question I asked him. I had a wonderful time."

"What did he tell you about his money?"

"Oh," she said. "I can't tell you that. Scotty said it was a secret. I must never tell anyone."

She took that secret out of the valley with her. She was very happy.

The valley ends a little north of Scotty's ranch. The great gravel fans from the Grapevine Mountains meet those from the Panamint Range and form a great wall of débris. The immense dead cone of the Ubehebe Crater is almost in Scotty's front yard. The fire that once spouted from the crater now lives in the flaming rocks of the Ubehebe Hills. The upper Ubehebe country is hard to reach. Only a pack train can penetrate the cañons that lead to the mountain valleys behind the bald scarp of the Panamints. The mountain sheep walk leisurely along their high angled trails. Only an occasional old mine or traces of the Indians survive to dispute the virginity of the country.

The same packers who run pack trains into the high Sierras in the summer move down into Death Valley in the winter to exploit the two hundred and fifty miles of mountains that hem

Death Valley in. The pack and saddle animals do not like Death Valley. All their feed is hauled in from more fertile regions and after it has been in the valley sun a little while it gets thoroughly dried out. The horses think they are eating snuff. They do not like the water either. They spend their summers in an abundance of sweet water running off the Sierra snows. When they are unloaded from the big trucks, which bring them into Death Valley, they thrust their muzzles into the valley water only to jerk their heads up at the first taste and spit the water out. They look indignant. Later on they get thirsty.

The prospector and his burros pack through the valley hills. The new model prospector is replacing the burros with a Ford or a Chevrolet. But the automobile will never replace the burro entirely. The automobile cannot find mines.

I was talking with Bill Corcoran and Jack Stewart and I asked, "Bill, how long have you been in the valley?"

Bill said, "Little over twenty years."

"You must have prospected the whole valley in twenty years," I said.

"No," said Bill. "I prospected for about five years, and I spent the rest of my time chasen my boorows."

"Listen to the man," said Jack Stewart. "Who found the mines? You, or your boorows? Why, if the prospectors in this country didn't have to get out an' look for their boorows they'd spend all their time setten in camp. They'd never find anything."

Jack is right. There is a Lost Burro Mine on almost every mountain. Now that Death Valley has roads and gasoline stations the prospector makes his long hauls in an automobile, but he uses his burros in the steep country where he cannot use anything else. The burro will find more mines.

Only a handful of the old-style prospectors remain in Death Valley. The prospector is a desert man looking for a mine. When a prospector locates a claim he becomes a mine owner with a mine for sale. There are a lot of mine owners in Beatty and Darwin, close to Death Valley. They sit in the sun and talk. When the grocery bill gets so high that the storekeeper complains, the mine owners become prospectors again. Quite often they sell a claim and are able to sit in talk for a longer time. A few mine owners have been out in the hills for fifteen or twenty years, sitting on rich property, with the ore all blocked out waiting for mining to get back on its feet. All they need is capital. They can sell you a mine.

Gold has been the chief lure to the prospector of the Death Valley region, but the wealth of the district is not confined in the gold and other precious metals. There is a variety of mineral wealth distributed throughout the southern part of the Great Basin. There are valuable salts, borax, soda, gypsum, potash and the nitrates. There are building materials: marble, onyx, brick clays and cements. The baser metals: copper, iron and lead. The gems: turquoise, opal, tourmaline, and the rarer garnets. The wealth of the hills has hardly been scratched. The rich treasure and the other products with sound economic value have been waiting for the roads to come to them and take them out. The roads are in Death Valley, reaching toward the hills.

I was standing with the roadbuilder in Hell's Gate, where the roads from the valley run east into Nevada, through Daylight Pass. The tall Death Valley Buttes were below us. Salt Creek sent a white slick into the fog of gray heat haze over the salt bed. The tall, impressive mountain ranges of the valley were barriers of dull blue and faded brown, between which the valley flowed south like old, spilled paint. An invisible car

Photo by Walter Fiss

THE CORNFIELD

tearing down the valley floor left a comet's tail of dust a mile long.

The roadbuilder said, "Quite a valley, isn't it?"

"Yes," I said. "It's been here a long time. And it will be a long time before it is thoroughly commercialized, and spoiled."

"It won't take long," said the roadbuilder. "There's been a lot of changes in the last five years. Now that the roads are in, the people will come in. There's times when I hate to see them come. But they're curious about the valley, and they'll come. A tourist asked me the other day when we were going to pave the roads. There's one job I do not want. When the pavement comes in here, the old valley will be gone."

EARLY INHABITANTS

One spring afternoon an airplane sang down into Death Valley and landed on Emigrant Wash. The flying visitors did not stay long. The long shadows of the Panamint Range hurried them back into the plane to race the sun to Los Angeles.

Four days later a desert Ford galloped across the valley in a cloud of dust and bucked to a nervous stop. Four Paiute Indians got out of the topless car to get comfortable in their pants and untie their legs and find their hats. A dignified old squaw sat in the back seat holding a beautiful new basket.

One of the Paiutes asked, "Where is the airplane? The old woman wants to take a ride."

We told him that the plane had been gone four days. The Paiute woman clucked her disappointment. She held up her new basket. Since she saw the airplane flying around she had been working day and night to finish the basket because she wanted to trade the basket for airplane rides for her two sons and herself. She had hurried and worked hard. They had come as soon as she finished the basket. They had driven sixty miles. And now the airplane was gone. The old Paiute woman was sad.

I asked one of the Indians, "How old is she?"

"Old? Seventy . . . Eighty . . . Ninety . . . I dunno."

Some one wanted to buy the basket. How much? The Paiutes palavered. Three airplane rides. But the airplane was gone. One of the Paiutes said, "Three, four years ago I saw airplane in Reno say fly with me ten dollars."

The squaw held out her basket. She said, "Three airplane rides. Thirty dollars."

It was entirely too much. The man who gave her thirty dollars for her basket knew it was too much. But she was so old and brave. Three airplane rides. She was so disappointed.

CHAPTER TWO

EARLY INHABITANTS

THE Great Basin Indians were long left undisturbed in their inhospitable desert land and naked ranges. The powerful tribes of the Shoshone nation occupied the arid and semi-arid plains and ranges west of the Rocky Mountains, spreading their dominion throughout the Great Basin country of Arizona, western Utah, Idaho, eastern Oregon, Nevada, and California. Through their lands came their first white men. The early Americans treking westward to the gold coast met the Shoshonean tribes to suffer bloodshed and occasional disaster at their hands. The desert Indian soon had a hard name and enjoyed no closed season. But in spite of his raids upon neighboring tribes, a fondness for scalps, and attacks upon the wagon trains and later upon the settlements of the emigrants, the Shoshonean did not attain the grim savagery that most desert tribes of the world seem to absorb from the harsh, relentless land in which they live.

The Paiute of the Death Valley region especially failed to measure up to the savage desert warrior—for several excellent reasons. His lands were almost barren and only grudgingly yielded him the scant means of supporting life. His land forced him to be a nomad, following the seasons and food. The same food scarcity definitely limited the number of stomachs that any locality could satisfy. Food, again, kept the family groups of the tribe so widely dispersed that any tribal mobilization of a

war party was distinctly impracticable. Death Valley and all its ranges never supported more than five hundred lives.

The Paiute was too well occupied with the problem of keeping his stomach full to indulge any passion for war paint and the warpath. The constant struggle of his everyday life hardened the Paiute to endure physical privation and toughened and blunted his moral fiber. His life was one long preparation for war and when he did make war he was a hardy, worthy foe. To this the California Indians most sorrowfully attest.

One or two thousand years before the white man saw the Pacific, the Sierra Nevada Range was a barrier between Indian nations, that were as far apart in type as the lands upon which they lived. The nomad Paiute of the Death Valley region wrested his living from his country at the cost of continued effort, while just west across the Sierras the peaceful, home-loving Indians of Southern California lived easily upon the bounty of the Pacific slope.

The Indians of Southern California were scattered in loose groups with small villages as the unit of a very feeble tribal organization. Tribes did not exist in the sense that they did in other Indian nations. The California groups moved from one camp ground to another, only to escape accumulated litter and not in response to any natural wanderlust or the demands of empty stomachs. The Californian was no nomad. He was low in the scale culturally. His arts, other than basket weaving, were in the first stages of development. He lived in a crude house of grass, tule, brush or bark. He hunted deer and small game without enthusiasm. He found fishing less strenuous. Even in his religion, the Californian lacked the earnestness and background of other Indians. His myths held no tales of heroic migrations, nothing of the glories of those fabulous ancients, his forefathers, whose deeds and communion

with the gods are the usual foundation of all savage lore. The Californian was characterized by lethargy and simplicity. He had no social or political organization, and his groups were never welded into homogenous tribes comparable in economic usefulness or power to any other Indian tribes on the continent.

It was upon these ineffectual Californians that the weight of the desert Paiute fell. The Sierras were not high enough or rough enough to deny the strong desert race, that swept westward from barren lands, to ride down the weaker Californians who barred the way into a land of plenty. For at least a thousand years before the white man arrived in the west and stamped out all natural forms of native life, the Paiute had been making the Californian very unhappy. The Paiutes of Utah, Nevada, and eastern California swarmed through the northern Sierra passes and drove the Modoc and Pit River Indians from the abundance of their hunting and fishing grounds. Before white settlers arrived on the Pacific coast in any numbers the Paiute had burst through Tehachepi and Tejon passes, seized and occupied Kern River, Kern Lake and White River and had driven a wedge into the lands of the Yokut that severed the nation. The aggressive Paiute always arrived without warning, and the unwarlike Californian lacked even the good sense to guard himself against surprise attacks by maintaining a few outposts in the mountains. The Paiute took no prisoners. He acquired many California grown scalps.

The Paiute was still raiding the fertile San Joaquin Valley in the spring of 1844 when General John Charles Fremont, with Kit Carson and a company of explorers, searched southward from *Rio de los Americanos* for the trail that led eastward across the Great Basin. Fremont found the San Joaquin teeming with game, with great bands of elk, many grizzly bears and antelope, and innumerable partridge, ducks and geese. This

profusion of game continued to attract the lean-bellied Paiute, and the earlier white settlers had the monotony of their lives varied by the swift descent of Paiute hunting parties that moved stealthily through the settlements at night. The Paiute raids were not ended until soldiers were put in camp at the western ends of the Sierra passes.

The swarthy Paiute was a well-formed Indian of medium height. His features were bold and he escaped the usual Indian tendency toward excessive fat in middle age because he led an active nomadic life. He was often a skillful and active dancer. He was always a great hunter and a great gambler. Gambling games amused the Paiute during his moments of relaxation from the constant efforts of the hunt. He also relaxed into an endless series of practical jokes. His jokes were crude slapstick. Few of them were nice.

The Paiute lived on good terms with his kinsmen, the Shoshonean, to eastward, but he had frequent clashes with the Apaches from the southern deserts of Arizona. If the Paiute's easy success in terrorizing the Californian tribes gave him any inflated opinion of himself as a bad man of war, his first conflicts with the Apache raiding parties convinced him that he had overestimated his prowess as a warrior. The Apache was a son of war. The Paiute was just a hungry Indian. In later years when the Apache came north into the Death Valley area, the Paiute also went north. The Paiute kept well in the lead.

The Paiute was a true nomad, constantly on the move. All his trails led to food and water. Tribal groups of from ten to forty families moved through the desert on a grand circuit of the food routes. Along the routes they stopped at predetermined points to hunt or to harvest the seeds and nuts which were such a large part of their diet. In following the seasonal

Photo by Pacific Coast Borax Company

DEATH VALLEY AND THE PANAMINTS FROM ZABRISKIE POINT

foods, the Paiute clung faithfully to the age-old trails of his forefathers. The rapid erosion of the hills and gulches made many of the old trails very difficult, but shorter, easier trails went untraveled as long as it was physically possible for the Paiute men and women to pack their heavy burdens over the trails that their fathers had used. The old trails were sacred.

The time required to complete the circuit of the routes that led to natural food ranged from several months to an entire year. At each stopping point close to some source of food the Paiute made camp. The camp was a collection of temporary shelters thrown up to house the Indian while he stripped the immediate neighborhood of food. Spring and late fall found the nomad Paiute on the mountain slopes or high mesas. Late summer and early fall sent him to the plains after the seeds of the many grasses and weeds. In winter he sought the warmth of the lowlands and lived on accumulated foodstocks and the game his hunting skill won. The Paiute chief who could guide his followers from one natural food source to another throughout the year and avoid hunger along the route was a wise and greatly respected leader.

The usual Paiute dwelling was a round or conical lodge, constructed from whatever material could be gathered near the camp. In the lowlands the wickiup was built of tule rushes over a framework of poles, or of tules bound together with willow. In the mountains where timber afforded some shelter, a few boughs of cedar and branches of sage and other shrubs were thrown loosely together under the overhanging branches of a low tree. In very cold weather the inner bark of the cedar was placed in quantities upon the bank of brush that formed the outer wall of the lodge. The cedar bark was also piled in layers on the limbs of the tree above the wickiup as an additional protection against rain and snow. A fire burned in the

center of the wickiup, with the entire family crowded around it. The fire was small, as were all Indian camp fires. The Indian never built a large fire in camp. He preferred to sit very close to a small one. The Indian had a great contempt for the fire of the white man. It was so large that the heat and smoke from it drove every one back into the cold.

The Paiute's camp sites were as old as his trails. They had been selected by his fathers and furnished water and firewood as well as food. The camps were used year after year and whenever a tribal group returned to a favored spring or stream the families invariably built new wickiups, even though the old huts were still habitable. The Paiute never destroyed a dwelling and was constantly building new ones, so that many of his camp grounds had the appearance of having been occupied by a very large tribe. In reality the camp débris was the accumulation of litter that resulted from repeated occupation by a small tribal group of perhaps a dozen families. Many observers misread the signs of these camps and consequently greatly overestimated the numbers of the nomad group.

The rock structure of the many mountains within the homeland of the Paiute offered him many natural shelters. There were comfortable dwelling-places among the rocks, beneath the overhanging ledges and in the caves. These the poor Paiute could not occupy because they were already inhabited by demons of varying degree. The more comfortable caves, naturally enough, were tenanted by the worst demons. Only the most inclement weather could drive the Paiute to the shelter of caves and there were some caverns he would not approach even in the worst weather. The Paiute had a free choice between enduring physical discomfort in the open or suffering mental agony in the caves. In either case he shivered. He preferred to do his shivering in his frail brush hut.

The bare plains and mountains over which the Great Basin Indian roamed, and from which he obtained his food, remain to-day very much as they were thousands of years ago when the Indians were the only inhabitants. Airways, railroads, and motor roads have pierced to the heart of the most desolate areas. Civilization has dug wells and run pipe lines, sunk mine shafts and built towns, modern hotels and desert resorts and imported the comforts demanded by the sightseer. But the acceleration of transportation and the arrival of the conveniences of civilization has had no effect upon the character of the country. It is the same land in which the desert Indian made his home. To the casual eye, valley and mountain are devoid of anything that could sustain life. For hundreds of miles the scant vegetation is woody, resinous, and rank. Water always seems to be miles away, according to the roadside sign. Animal life seems to be confined to a few lizards, one covey of quail, an occasional snake, and a scrawny roadrunner. The traveler who sees the Death Valley country for the first time is inclined to disbelief when he hears that the district once supported several hundred Indians, especially when he recalls that a handful of emigrants almost starved to death close to the sites of Indian camps. He wants to know what the Indian ate when there was nothing to eat.

Early white pathfinders and observers were greatly interested in how the desert Indian managed to keep alive in the barren lands he made his home range. They were not long in discovering that the desert Indian ate practically everything. The diet of the Great Basin Indian included nuts, seeds, fruits, leaves, fleshy stems of plants, bulbs, roots, the inner bark of trees, mammals, birds, reptiles, fishes, and insects. Many of these foods required ingenious and elaborate processes before they were fit for consumption.

Starchy material in the form of seeds formed the greater portion of the Indian's plant food. The most important starchy food was the nut of the Nut Pine, which grows in the desert mountains above six thousand feet. The Indians beat the pine cones from the trees as soon as they were mature in early autumn. They gathered the cones in baskets and spread them upon a smooth plot of ground where they were exposed to the heat of the sun until the scales on the cone became dry and cracked apart. The seeds were then jarred loose by blows with a stick and shaken out of the cone. Large quantities of the pine nuts were gathered every fall and most of the harvest was cached in dry holes among the rocks as a reserve food supply. When the nuts were properly stored, they remained fresh and edible for several years.

The pine nuts were roasted in a basket containing live coals, the basket being shaken, or the nuts stirred about until the roasting process was complete. The Indian shelled the roasted seeds and either ate them dry or ground them into a flour from which he made soup, mush, or baked cakes.

The Paiutes explained that they had first obtained the pine nuts through the kindly offices of their gods in the far distant past, when the animal gods lived upon earth among men. *It-sa,* the mountain sheep, was one day hunting upon a distant mountain when a strange, sweet odor was brought to him by the wind. *It-sa,* the legend said, traced the odor to discover what the new food could be. He searched for a long time until the odor became very strong and *It-sa* knew he must be close to its source. Very soon thereafter he came upon a great number of strange people seated upon the ground, very busily eating pine nuts. *It-sa* asked for some pine nuts but the strange people refused him. They did give him some mush to eat but he found that he could not swallow it.

It-sa returned empty handed to his own country and told his brother, *Pi-aish,* that he had discovered a new food. He explained that they would need help to get a supply of it because the people who had it were not giving away samples. *Pi-aish* went to the cave where the animals lived and procured a woodpecker and a mouse. The four then went in company to the land of the pine nuts. When they arrived there they found that the people still refused to part with any of the nuts. *Pi-aish* put a lot of hard thought on various schemes and finally decided that he knew a method of obtaining some pine nuts. *It-sa* and *Pi-aish* gambled with the strangers to divert their attention and the mouse searched the camp. The mouse discovered the main supply of nuts in a little sack that was tied to the back of the chief's bow. The sack was firmly bound to the bow with many turns of sinew and the mouse was unable to tear the sack loose.

The mouse privately told the mountain sheep that he had located the nuts but that it would not be possible to obtain them because they had been made very secure. *Pi-aish,* however, had not brought the woodpecker along just to keep him company. He told the woodpecker to fly high into the air and drop down with great force and strike the sack of pine nuts with his sharp bill. The gambling went on while the woodpecker did as he was told. The woodpecker freed the bag on his first attempt and flew off with the pine nuts. *It-sa* and *Pi-aish* planted the nuts in their country and they have grown there ever since.

The Paiute apparently abandoned other deviltries long enough to invent the bed-time story.

When *Pi-aish* and *It-sa* came back to their own country with the first supply of pine nuts all the animals assembled in a great council to determine who should eat the new article of food.

"I know how we shall determine," said *Ta-vu,* the little rabbit. "Let us go to sleep and dream. All who have good dreams can eat pine nuts and those who have bad dreams must search for something else to eat."

They all fell into a deep sleep. *It-sa* and *Pi-aish,* the two mountain sheep, and many others had bad dreams. Others had good dreams and left at once for the mountains where the pine nuts grew. Those who were barred from eating pine nuts by their bad dreams remained and complained bitterly.

The crane said, "I am going to fight these people who eat pine nuts." And he went into the mountains and fought a great battle and was killed. *Ta-vu* brought him to life and told him that he must never give anyone any trouble again.

It-sa was not satisfied with his dream and went to sleep, hoping that he would have a better one. But his dreams were bad. He and *Pi-aish* tried many times but had no good dreams. At last *Pi-aish* said, "We shall never have good dreams. Let us go our way." And the two mountain sheep cried for a long time and at last went away to live on grass.

The rock also had bad dreams and said, "I shall not eat anything."

And a little flint with a curious mark on his breast had been one of the dreamers. He joined the rock and decided not to eat at all. He went a little further in his anger and said, "I will always be the enemy of the people who eat pine nuts."

The Indian hunter has always known that the curiously marked flint made a very deadly arrowhead.

The Paiute found food in the seeds of almost every non-poisonous plant. The common sand grass of the desert produces an abundance of seeds. The Paiute squaw harvested these seeds. She beat the seeds from the grass with a wickerwork

paddle wielded by her right hand, and caught the seeds in a small basket carried in her left. When the hand basket was full she emptied its contents into a pack basket, which she carried around on her back. The harvest of sand grass seeds was ground into a flour by the squaw and the chaff winnowed or sifted out.

All of the harder seeds gathered for food were ground into flour between two stones. The smaller, upper stone was worked by hand over the slightly concave surface of the larger, lower stone. These stones have been found all over the desert. Usually the stones are arranged in a semicircle where the squaws sat in gossip, making flour for their men.

Another item of Indian food was furnished by the abundant fruits of the devil's pincushion. The seeds of this cactus are enclosed in woolly cocoons which are well guarded by spines. The squaws pried the cocoons out of the spines with a stick, broke open the seed vessels and poured out the seeds. The seeds were gathered in the fall and stored for use during the winter.

The seeds of the joint fir were roasted and ground and a bitter bread made from the flour. Several species of the evening primrose gave up their seeds to the industrious Paiute squaw. The berries of the boxthorn were gathered to be eaten fresh or to be dried and made into a mush or soup that was eaten without cooking.

The Paiute had two methods of preparing the edible prickly-pear. In May and early June, the flat, fleshy joints of the new growth, as well as the buds, blossoms, and immature fruit are fully distended with sweet sap. The fleshy joints were broken off and collected in large baskets. Each joint was thoroughly rubbed with grass to remove the fine, barbed prickles and the joints were exposed to the sun. The sun-dried joints kept

indefinitely and were made ready to eat by boiling and adding salt.

The Paiute also used the now familiar barbecue method of cooking the prickly-pear joints. The Indians dug a hole in the ground about ten inches deep and three feet in diameter. The hole was lined with stones and a fire built in it. Other stones were thrown in while the fire burned. When all the stones were hot the Paiute removed the ashes, coals, and all but one layer of the stones and lined the hole with fresh or moistened grass. He then laid down alternate layers of cactus joints and hot stones until the pile was well rounded. A mat of sedge was put over the pile and the mat was covered with a layer of moist earth. The cactus was allowed to steam for twelve hours. Some of it was eaten at once, but as it was prepared in large quantities portions of the cactus were dried and cached. The dried cactus joints resembled dried unpeeled peaches.

Several of the large desert crucifers have tender leaves and stems with the flavor of cabbage. In preparing this desert substitute for cabbage the Indian soaked the leaves and stems in boiling water for several minutes before he washed and squeezed them in cold water. This rinsing process was repeated five or six times to remove all traces of bitterness as well as the vegetable substances that would act as violent purgatives if they were eaten. The leaves were dried and used exactly as cabbage. When food was scarce this same process was applied to almost all green herbage on the desert.

The ripe pods of the mesquite and the screw bean store a small amount of nutritious matter, principally sugar, in the spaces between the hard bony seeds. The mesquite pods were gathered in the autumn but were usually saved for spring use. The dry pods and seeds were pounded to a flour in a mortar and the flour was sifted out and made into small cakes or loaves.

Photo by Walter Fiss

THE WIND-SWEPT SAND OF LOST VALLEY. NORTHERN PANAMINTS IN BACKGROUND

The cakes were often sun dried and preserved for a long time.

The Paiute found his sugar in the common reed. When the reeds had attained nearly their full growth in early summer they were cut down and dried in the sun until brittle. The whole plant was then ground and the finer portion separated by sifting. The flour was molded by hand into a thick gum-like mass and placed near a fire to roast, until it swelled and browned slightly. The Paiute was very fond of this soft taffy. He liked sugar in any form. In the spring he stripped the bark from the pine trees and scraped the sweet substance from the inner surface of the bark.

The vegetable food supply of the Paiute also included cactus fruits which were divested of their spines and squeezed to a pulp by hand. After all the juice was forced from the pulp, the Indian shaped the pulp into rolls, sun dried it and stored it. The caching of vegetable food was the only system the Indian had to accumulate food reserves to carry him through the lean seasons, when there were no natural crops to sustain him. The Paiute was always hungry and as long as there was any food in sight he was an unnecessarily heavy eater. He stored portions of the crops he gathered, not only to preserve it from deterioration, but also to safeguard it from his voracious appetite. Whenever the Paiute buried food in the ground he built a fire over the cache and kept it burning for several days. The fire destroyed all food odors that might have attracted animals to the destruction of the hidden food.

The Paiutes on the Nevada side of Death Valley had their great gorge of the year late in April when they feasted upon the short, thick axis and the young leaves of the Agave. The Agave, which is also known as the mescal plant, closely resembles the century plant and grows in great profusion upon

the slopes of the Charleston Mountains. Many of the hillsides are covered with the plant. The Agave was cooked by the hot stone and steaming process in pits that were two to seven feet in diameter and from one to three feet deep. Traces of the old barbecue pits are still to be seen on the Charlestons where the Paiutes gathered every year to enjoy the pains of overeating.

The Agave required a two days' steaming and when it was cooked it had a jelly-like appearance and texture and a delicious taste. The leaves of the plant were threaded with tough fibers that no steaming would ever soften and it was Indian etiquette to chew out the edible portion of the leaves and eject the wad of fibers. Dr. Frederick Vernon Coville of the National Herbarium relates that he came upon a forsaken feasting ground in the Charlestons in the nineties and found dried and weathered wads of the Agave fiber which were so large that the oral capacity of the Paiute must have been tremendous in order to have contained them.

Eating was always a serious affair with the desert Paiute, but it was during the Agave harvest that he gave himself without restraint to the pleasant task of cramming his stomach. He ate and slept and ate. The pits of cooking Agave steamed through the days. The Paiute ate when he was not hungry. The last of the crop was cooked and eaten. The lean days had returned.

The Panamint Indians had no species of Agave growing in their lands on the Panamint Range, but they had a sweet, nutritious substitute in the young buds of the Joshua-tree. The buds of the Joshua-tree are terminal upon the branches and are protected by a close rosette of stiff, dagger-like leaves. The leaf fiber is so tough and the buds are so inaccessible upon the stem that it is difficult to chop one out with a modern camp axe. The dexterous Paiute plucked the well-guarded buds by hand. He drew the four or five uppermost mature leaves

together over the apex of the bud and grasped them in his hand. He broke the head from the brittle stem with a double arm motion; a quick twist of the wrist and a sharp, downward bend. The mature leaves and green tips were discarded and the remaining pulpy bud, rich in sugar and other carbohydrates, was roasted on hot coals. The cooked bud was eaten either hot or cold.

The berries growing on the upper mesas and in the watered cañons of Death Valley were eaten raw or were ground up with one of the seed meals to form a paste that was cooked and served as mush. The bulbs of many plants were boiled or roasted. The leaves of a variety of weeds were used as greens and were sometimes boiled with meat. The desert Indian topped off his diet with wine made from the cactus fruit and some of the native berries. He knew the vegetable resources of his country so well that he could become mildly inebriated even when he was far from camp. He chewed the seeds of the jimsonweed.

The highly refined domestic economy exhibited by the Paiute in his wide selection of vegetable food was extended to his meat diet. The Paiute ate practically all the animal life of his country. He and his cousins throughout the Great Basin killed and ate elk, mule-deer, mountain sheep, otters, rabbits, badgers, prairie dogs, porcupines, ground squirrels, wood rats, kangaroo rats, white-footed mice, lizards, grasshoppers, crickets, and snakes. The more fortunate desert Indians, whose lands held the larger game, did not eat the wolf, fox, swift, mountain lion, wildcat and kindred beasts unless famine threatened. But to all the Paiutes, in times of hunger, food was food.

This list of game that was available includes all the species of wild life found in the limits of the vast Great Basin. The Paiute of the Death Valley region had but few of the animals

within his hunting grounds. A mountain sheep or, more rarely, a deer was his largest bag. He found his meat in the jack-rabbit, the cottontail, the rats and mice, and the chuckwalla lizard.

The Paiute held an annual rabbit drive just after the fall harvest of the pine nut. Long nets, a foot and a half or two feet high, constructed from the fibers of the Joshua-tree or of Indian-hemp, were spread in a great semicircle in the brush. The entire tribal group armed itself with stones, clubs, and bows and arrows and formed into a long line of beaters. The beaters drove through the brush, converging on the open mouth of the net. As the Indians advanced, throwing stones and beating the ground with clubs, the rabbits fled toward the net. Rabbits that seemed likely to escape the meshes of the net were shot down with arrows. The rabbit flesh was dried. The pelts were cured and either made into robes for winter wear, or cut into strips that were woven into blankets.

Other nets of finer mesh were spread at the waterholes in the high valleys to snare quail and dove. Ducks and geese that stopped their flights in the watered regions of the desert fell before the Paiute arrows. All the game birds required expert stalking and infinite patience when hunted with a bow and arrow. The Paiute shot them on the ground while they were feeding or drinking.

Grasshoppers and crickets were an important item in the diet of the desert Paiute. He caught them before they were able to fly or when they became chilled with the cold of night in their passage over the higher mesas. They were gathered in great quantities. They were swept up with a brush or driven into pits by beating across a mesa. The grasshoppers and crickets were roasted in trays like so many seeds.

The Paiute was very fond of a mulligan, into which he put

everything he had collected during the day; seeds, lizards, fruits, grasshoppers, and greens. He also liked birds' eggs when he could find them. He liked his eggs best when they were about ready to chirp.

The westernmost branch of the Paiutes lived in Owens Valley, along the eastern base of the Sierra Nevada Range. The Owens Valley Indians added two unusual foods to the Paiute menu. Countless grubs or larvæ sprang from the eggs of a fly in the shallow water along the shores of Owens Lake. The Owens Valley Indians scooped up these grubs and ate them. Eaten raw they had a rank oily taste. When cooked into a soup the grubs were not quite so noxious, but they were still a very hungry man's food.

Even the snakes did not escape the Indian in Owens Valley. He ate several varieties. He impaled the snake lengthwise on a stick, while it was alive, and held it writhing over an open fire and broiled it.

The hunting weapons of the Paiutes included clubs, javelins, shy-stones, and bows and arrows. A stick with a curved hook was used to drag rabbits forth from their burrows.

The bow of the Paiute was about three feet long and was made from the wood of the desert juniper. The Indian selected the stock for his bow from a tree that had died and seasoned while it was still standing. As rot is unknown in dead wood in the low altitudes of the desert mountains, the wood of any of the dead junipers was in perfect condition to be shaped into a bow. The bow was strengthened by a number of strips of deer sinew that were glued along the length of its back. The bow-string was made from twisted deer sinew or from a cord of twisted Indian-hemp. The Paiute hunting arrows often bore fur and blood for more than five inches back from a wooden point. The Paiute bows were powerful.

The arrows were made from the stems of the common reed or from shoots of willow. The arrow shaft was three and a half feet long. In making a reed arrow shaft the Indian selected a nearly mature, but still green, reed. He removed the leaves and dried the shaft at a fire, straightening the shaft as it dried. The straightening process sometimes required the use of a special stone which bore grooves large enough to admit the arrow shaft. The stone was heated and the arrow laid in one of the grooves until it became hot. The Indian then seized the irregularity of the shaft between his teeth and bent the ends of the shaft to correct the defect. He repeated this process over the entire length of the shaft and produced a remarkably straight arrow.

Willow arrow shafts were made in very much the same way, with an additional step in the process corresponding to sandpapering. The Indian sandpapered the willow shoots by drawing the shoot back and forth in the angle between two flat, sharp stones, which he held in the palm of one hand.

The Paiute arrowhead was made from one of the hard greasewoods. It was about five inches long and tapered to a blunt point. In attaching his arrowheads to the shafts, the Paiute inserted the base of the arrowhead into the hollow of the reed for three-quarters of an inch, so that the arrowhead base was butted against a joint in the reed. He bound the head and shaft together with a thin band of sinew. The base of the shaft was notched to receive the bowstring, and three slightly twisted half-feathers were bound to the shaft to impart a rotary motion to the arrow in its flight.

Large flint arrowheads fell into disuse when the Paiute gave up the warpath. In manufacturing the flint arrowhead, the Paiute first roughly blocked out the form of head he desired by heating the flint and dropping cold water upon it. The cold

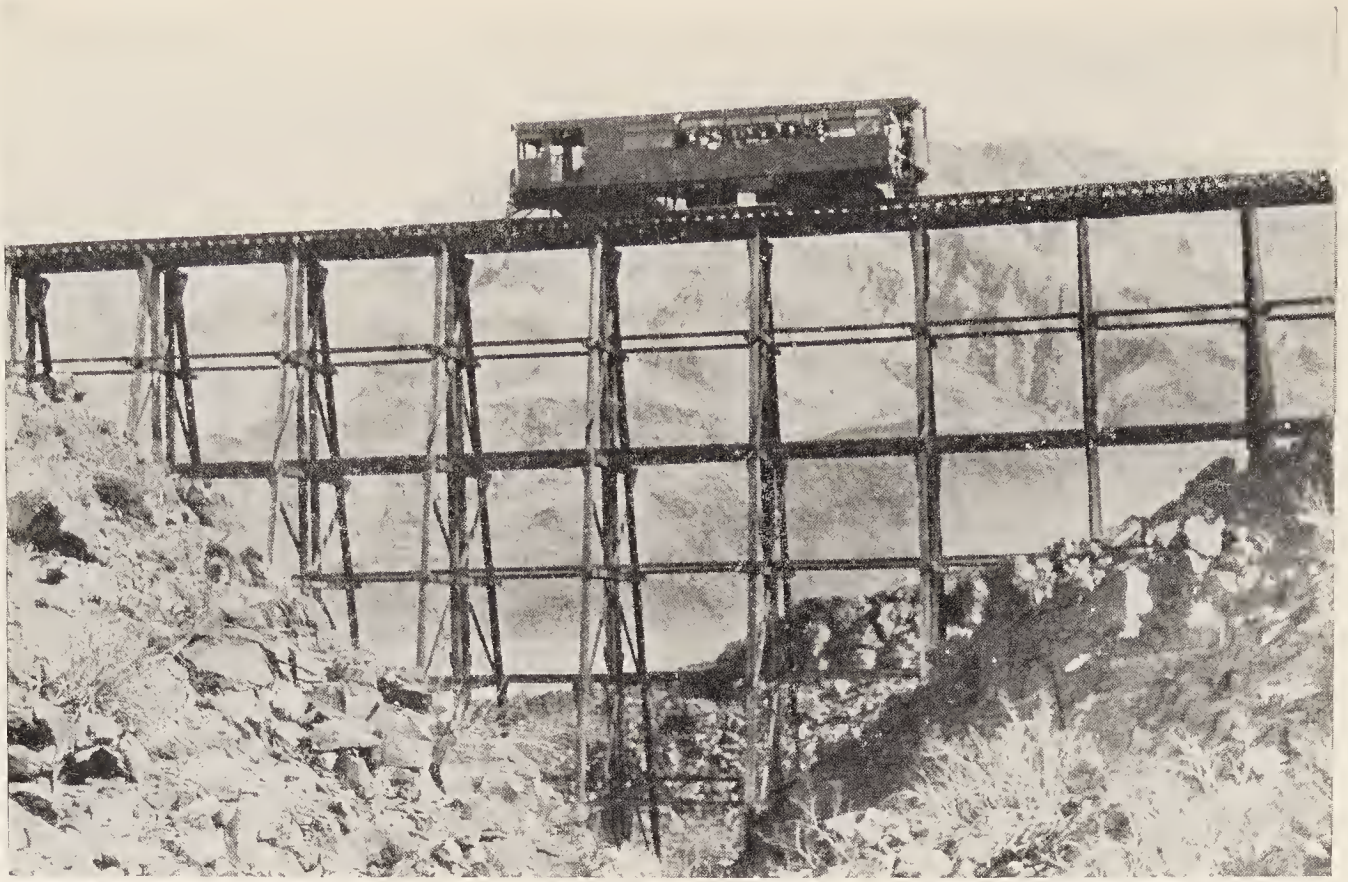

Photo by courtesy Union Pacific System

NARROW-GAUGE GASOLINE CAR EN ROUTE TO EASTERN EDGE OF DEATH VALLEY AND FURNACE CREEK

water caused rapid local shrinkage and the flint flew off in large scales. The flint was trimmed to its final form with a hollow bone that was half an inch in diameter and four inches long. One end of the hollow bone carried a vee notch, deep enough to admit the edge of the flint. The Indian held the flint in his left hand and the bone in his right. He placed the notch of the bone over the edge of the flint and then worked the bone rapidly back and forth as he moved the flint through the notch. The ease and speed with which the soft bone carves the flint surprises all experimenters who have burned their fingers trying to shape arrowheads from hot flint by dropping cold water upon it.

The Paiute was a confirmed advocate of the poison-arrow. He poisoned almost all his arrows. He wanted them to go straight to the mark. His poisons were innocuous enough. He used the blood of the specie that happened to be the object of the hunt. Hunting sheep, the Paiute poisoned the arrows by dipping them in sheep blood. Deer were sure to be laid low by an arrow with deer blood on its head, and an arrow wet with rabbit blood could hardly miss the fast moving jack.

Some of the Paiute hunters carried the fetish a little further and reserved certain arrows for certain game. The quiver of a mighty hunter contained arrows that varied slightly in design or weight, or carried arrowheads of peculiar shape that were supposed to possess especial charms. The hunter referred to his arrows as the sheep-arrow, the rabbit-arrow, or the deer-arrow; and used the special types only against the game for which he had designed them.

Before the white man came into the Great Basin and the Paiute acquired a frying pan, iron kettles, wire sieves, and knives and forks, all the domestic utensils that the Indian needed were supplied by the vegetation that grew on the apparently barren

mountains. The Paiute had almost no pottery. Early observers of the Paiute say nothing of pottery, and the few crude specimens that have been recovered indicate that the efforts of the Paiute at pottery making were not very extensive. Basket making, however, was a well developed industry among the Paiute squaws. Wickerwork receptacles, such as packbaskets, plates, potbaskets and water baskets were in constant use in the Paiute camp. The materials that went into the baskets grew wild on the land. The squaws did all the work on the baskets and you could drop a basket more than once. There was no reason why the Paiute should concern himself with pottery.

The packbasket was used by the Paiute family to transport all sorts of material. It was used on the march and in the harvest of the seeds. The basket was funnel-shaped with a flat base. It stood from one and one-half to two and one-half feet high, with a proportionately smaller width. The packbasket was carried on the back between the shoulders, with the body of the bearer bent well forward. The Indian, it was usually the squaw, supported the basket either by grasping the rim with the hands or by using the familiar tump line, a simple thong of native rope, horsehair, or leather, attached to the basket and passed across the forehead of the bearer.

The potbasket was in the form of a pot or bowl. The most common basket bowl was rather deep, with curved sides and a flat bottom. It held about three pints. The squaw used the potbasket as a general measure, as a bowl for soup or dry food, and as a hat. The texture of the well-made potbasket was close enough to hold water. Food was boiled or stewed in the potbaskets before the Paiutes obtained iron pots. The heat necessary to cook food in the basket was applied by dropping hot stones into the contents of the basket.

The water basket was urn shaped with a narrow neck and

with its greatest width at its shoulders. Its capacity was from two to three gallons. The entire inner surface, and frequently the outer surface, was coated with pitch. Two loops of horsehair or equally strong material were woven into the shoulder of the basket and to these loops the headstrap was attached. The water basket was packed in the same manner that the pack-basket was carried.

The Paiute tribes modified these more or less standardized forms of baskets to suit individual preference or to meet some special use. All the baskets were woven from the simplest materials by the squaws. The squaw selected the year-old shoots of tough willow growth, the year-old shoots of aromatic sumac, the long, slender and flexible horns of the mature pods of the unicorn plant, and the long fiberous roots of the Joshua-tree. These growths gave the squaw three colors to work with; the white of the willow and sumac, the black of the unicorn plant, and the red of the Joshua-tree. The root fiber of the Joshua-tree was strong and handsome but it could not be used in closely woven baskets, because it was too thick to be plaited closely enough to prevent interstices in the finished fabric. Most of the baskets were made from sumac and willow.

The squaw first stripped the bark from the shoots she had gathered. She picked up a shoot of willow or sumac and bit the bark loose at one end of the shoot. Then she stripped the bark off. She took a sharp stone and removed all bud protuberances and other inequalities on the wood. She put the cleaned shoot away to dry. These cleaned and dried shoots of willow and sumac were one of the two elements from which she made her baskets.

The squaw prepared the second element for her baskets from the same material. She selected a fresh willow or sumac shoot, broke off the portion that was too slender for use, and

bit into one end of the piece she retained, so that it split into three nearly equal parts. She gripped one of these parts in her teeth and one with each hand and split the shoot through its length, skillfully guiding the progress of the splits with her fingers, so that she obtained three even strips. She then took each strip separately, split off the pith and the less flexible tissue between the pith and the wood, and peeled the bark from the outer surface. From the single shoot she had obtained three strong, pliant, flat strips of wood.

Both the round shoot and the flat strips would keep indefinitely after they were dried, but they had to be soaked in water before they could be woven into a basket. The squaw began the construction of a basket by laying down two layers of the round shoots, the second layer at right angles to the bottom layer and fastened to it where the shoots crossed each other. The flat strips were woven in and out between the round shoots and as the basket widened the outer ends of the shoots were bent upward and more shoots were inserted to carry the woven strips. The squaw spent a month on the manufacture of a potbasket or packbasket. She obtained dyes from native berries to decorate the basket or wove the ornamentation directly into the basket by changing the weave or leaving the bark on some of the shoots.

The potbaskets and plates of the Paiute squaw were her best product. These baskets were so good that they take a place with the best Indian basketry of this continent. She was very careful in her selection of the material for the potbaskets and plates and she assembled the elements of the basket with consumate skill. The flat willow and sumac strands were very narrow and of the finest quality to permit the squaw to weave them very closely with the narrow black strands of the unicorn plant, and the long, slender stems of the native grass. The

Photo by Walter Fiss

LOST VALLEY FROM TUCKI MOUNTAIN

strands of the unicorn plant were four to ten inches long and very tough. The native grass was obtained in lengths of eighteen inches.

The foundation of a potbasket or a plate was a bundle of grass stems to which the squaw sewed the flat strips of willow or sumac with a fine willow thread. The squaw pierced the strips to receive the thread with a native awl made from a stout, sharp spine from the devil's pincushion, a common variety of cactus. The baskets and plates were woven and sewn, the depth of the wall being controlled by the tightness of the weaving and stitching. The grass bundles made a perfect packing when the stitches were drawn tight and the completed baskets were watertight.

Paiute basketry is becoming rare. The Paiute squaw gave up the quantity production of her beautiful baskets soon after the pots and pans and buckets of the whites were obtainable. Basket making has almost become a lost art among the Paiutes. The race itself was almost swept away as the hand of civilization reached into the Great Basin to grasp the wealth of its plains and ranges. The same hand, however, brought comforts that were unknown to the Paiute and new foods easily obtained. The Paiute became acquainted with the bacon and beans of the mining camp. He stopped grubbing through the hills. He got a knife and a can opener.

The desert Indians' manner of living began to change as soon as the whites established their first outposts. Life became easier for the Paiute. According to many students of the decline of the Indian, his new life was too easy. He accumulated excess energies. No longer required to spend all of his time assembling his next meal, he experimented in mischief, thievery and warfare.

PAIUTE LORE

PAIUTE SONGS

Winter

The red clouds of sunset are drifting
Like down on the peaks of the mountains.
The feathers of the reed are lying on the ground,
And the quails are perched in the pines.

Storm

On the peak of the mountain,
The eagle is dancing,
The tempest is roaring.

At morn the eagle will cry
On the further shore of the hills,
And a rainbow will be in the sky.

The Rattlesnake

Crawling along, crawling along,
Through rocky cañon
Crawling along.

Through stony land, close to a rock,
With head erect
You crawled along.

By the bush-cactus mound
You were passing along.
By the bush-cactus mound
You were passing along,
Wriggling and crawling along.

The River

The edge of the sky is the home of the river.
In the blue water the trout wags its tail.

CHAPTER THREE

PAIUTE LORE

THERE are countless authorities upon the many divisions of Indian history and Indian behavior. Very honest observers have gone among the Indians to study them and their history. Few of the accounts agree. Other observers, not quite so honest, have taken the Indian apart and selected the facts that advanced their own pet ethnological theorems. There is such a snarl of conflicting evidence and contradictory conclusions about the Indian of any tribe that it is possible to prove almost anything about any Indian. By a judicious selection of authorities any story about any Indian may be given that greatly desired tone of finality.

Fortunately for this story, the Indians of the Great Basin came under the observation of a keen ethnologist whose active interest and sympathy lent life to all his writings without detracting from their accuracy; and it is in these writings that the history and the recorded habits of the Great Basin Indian are preserved. Lacking the reports of Major John Wesley Powell, this chapter could not have been written.

Major Powell was born March 24, 1834 and died September 23, 1902. His life was devoted to explorations and investigations in scientific fields. He organized the Bureau of Ethnology of the Smithsonian Institution and carried on its researches up to the time of his death. The loss of an arm at Vicksburg did not restrain the driving spirit that urged him into further physi-

cal perils during scientific surveys that were nothing short of heroic adventures.

In 1903 Professor Stephen S. Langley was Secretary of the Smithsonian Institution and in making his annual report to the Board of Regents of the Institution he paid the following tribute to Major Powell:

> I have been with Major Powell in the life of the city and in the life of the wilderness, and wherever I have been with him I think I have been more impressed with the simplicity and self-comprised nature of his character than even with the complexity of his knowledge and achievements. Besides his splendid capacity for leadership in battle or adventure, besides his varied knowledge as a scientific man, the mystery of this world, which pure science so little recognizes, was always present to Major Powell's mind; the lapse of ages, the wonderful birth of species, the path that threaded past times, on and up to man—all these things were present to his thought and colored his work—were always associated with what he did as a man of science, and constituted his innermost point of view.
>
> He was a generous man, kind to others and helpful; a brave and always self-contained man who found in himself counsel sufficient for his need. He was a stoic who suffered long years of pain in silence, and who, at the end, met the approach of death as though it were a familiar incident of life. We shall not often look upon his like.

This is the Major Powell whose breadth and fidelity are reflected in his Indian reports, and it is from a small portion of his reports, notes and manuscripts, written in the field in the sixties, that this present story of the Indians of the Death Valley region is largely drawn.

The social organization of the Paiute was the simple one of the barbarian, with none of the elaborate codes of laws, ethics, and economics, with their multiplicity of safeguards which our civilization has been forced to erect in order that our system might endure. The Paiute tribal band of from four to forty families was led by a principal or executive chief, by a war

Photo by Stephen H. Willard

TELESCOPE PEAK FROM THE FUNERALS

chief, and by a chief of council; three offices that were usually vested in one man. The chief of council was usually the tribal leader. This leader was not necessarily the oldest man in the tribe, but he was always the most powerful and the most respected. His immediate family was the unit of organization, and he himself presided over the highest court of tribal authority, the council of elders.

The council of elders was a gravely ceremonious organization of family leaders. The council met and operated without written laws and with no legal or executive machinery. Yet its mandates were never questioned. They were beyond question. They were based upon tribal mythology and the maxims of the gods, sources of authority the Indian had been taught to hold in the greatest awe from the moment he first understood the spoken word.

The council of elders decided in the light of its own wisdom all the important questions that confronted the tribe. It decided for peace or war, effected or terminated alliances with other tribes, planned the all-important food routes to be followed by the tribal groups. It allocated the definite lands over which the separate groups were to forage. The food routes assumed an immense importance in the Indian mind. They led him either to food or to hunger, and as long as they fed him they were the elemental bond of the desert Indian's strong attachment to his range lands. The early white never understood why the desert Indian reverenced the desolation of his arid deserts. The white man never took the trouble to analyze the Indian viewpoint.

The Paiute was distinctly land conscious. His race followed the same trails over the same country for generation after generation, varying the route only as the council of elders decreed or as the old trails became impassible. The home ranges of

the Paiute nourished him and had nourished his fathers before him. His lands held his family and all that was dear to him. Tribal mythology told the Paiute that his gods had lived in his home lands and had created his race within the very region he called home. His lands were the seat of his national pride. His lands established him in the eyes of other tribes. So profound was the influence of land upon the desert Indian that one Indian never asked another to what nation or tribe he belonged, he simply asked "To what land do you belong? How are you land named?" The land named the Indian. The Indian's name was his title to his lands. When Indian lands were invaded by the whites the Indian resisted, stubbornly and futilely. The whites called him a savage and accused him of atrocities. The Indian was a simple patriot.

The Paiute knew that he was one of an illustrious race. He was well instructed in the history of his tribe and the glories of the early days of his race. The chief of council and camp preachers drawn from the oldest members of the tribe kept the Paiute's memory fresh by frequent harangues. All of the Paiute instructors quoted from a fund of tribal legends as they laid down the rules of conduct by which the tribal band and the individual Paiute were governed. At dawn every morning the chief of council called upon all the people to pay heed to his words of wisdom. The family groups sat attentively about their own fires and listened to the cant tones of their respected leader. This morning address usually dealt with some immediate problem that had been presented to the chief of council for solution, or some edict of the council of elders, but the speaker's subject of the moment was interwoven with tribal history, as the chief of council described how the ancient Paiutes had conducted themselves under a similar set of circumstances.

The chief of council often started his people upon a clean

fresh day by warning them not to waste time in excessive gambling. Food must be stored and quickly, winter was coming on. There were perils lurking in the petty quarrels that went on within the camp. The ancients had always been friendly. The chief corrected the lawbreakers. He prescribed the labors of the day in detail, directing the tribe to harvest seeds or nuts, or to hunt, and he apportioned the tasks of the harvest or hunt among the family groups.

As the chief talked his way through his morning address, always emphasizing his points by ancient analogies, the elders in a family group kept the younger Paiutes attentive to the words of wisdom. As the chief brought some especially effective argument to its climax, the youngster would be prodded and told, "The talk is good." If the young Paiute chanced to be a malefactor and the chief was discoursing upon his misdemeanor, the repeated assertion of the elders that the talk was good, each assertion accompanied by a vigorous prod, usually convinced the youth that his ways were thoroughly evil. He would model himself after the ancients. It would be more comfortable.

Every Paiute tribe of the Great Basin country had preachers who were skilled in recounting the tribal lore; the wise actions, the maxims and the history of the gods. During the long winter evenings the men and women, the young bucks and maidens, the boys and girls, assembled around a ceremonial fire to listen to the history of the ancients. The scene presented a fascinating picture. The blazing boughs of pine or sage illuminated the graven, dusky faces against the enveloping darkness beyond the firelight. The silence, tense with expectation, was broken only by the crackle of the burning wood or the quickly stifled bawl of a child. And then the preacher took up his story, speaking the words of the story, and acting the story the words told.

The Paiute was a great natural actor. He was an Indian. The conditions of native Indian life had trained him in a natural sign language. There were scores of languages among the two hundred and fifty thousand or three hundred thousand Indians who inhabited the United States, and the many basic tongues were further broken up into many dialects. Often an Indian language was spoken only by a few hundred or a few score of the Indians. The need for a means of communication between tribes of different tongue evolved a sign language. The average Indian was a master of the sign language but the skillful tribal preacher was a dramatic artist. He could talk with the features of his face, with his hands and feet, and with the muscles of his body. Under the inspiration of a message from the gods he had an intense power and could sway his audience to his will. He was always sure of the reverent belief of the elders and he played upon the superstitious credulity of the younger Indians until they shivered with fear or crowed and danced with delight.

As the preacher spoke and acted his story he pointed every moral he developed in his tale. His preachings were one of the most important institutions of the Indian. The preacher's dramatic recitals taught the Indians their mythology and their religion, their miraculous history, their authority for their governmental institutions, their social customs, and their daily duties to the tribe. The tribe sat attentively before the masterful presentation of the tribal lore and as the months and years went by every Indian who listened to the preacher gradually absorbed a complete knowledge of the unwritten bible of savagery.

The religion of the Great Basin Paiute developed from the basic ideals common to the primitive races of the world. The Paiute, as a great hunter, closely studied the animals and

became more thoroughly acquainted with them than with any other objects or phenomena of nature. From the animals the Paiute obtained most of his clothing and part of his food. He witnessed frequent exhibitions of animal knowledge, skill, and power superior to his own. He saw the squirrel living in the trees and passing effortlessly from bough to bough; the lizard streaking swiftly over vertical cliff faces; the hummingbird poising in the air over a blossom; the snake running swiftly without legs; the eagle soaring through the air and living in the clouds. Paiute philosophy furnished the Paiute no explanation why these animals surpassed him in so many ways. His admiration for the animals grew to adoration. The animals became gods.

Another sentiment, veneration for the past and the events of the past, which is common to the human race, was much stronger in the savage breast than it is within civilized man. Ancientism led the Indian to worship the progenitor and the past with all that was unlovely obscured in the perspective through time. This reverence for the past, those perfect early days of his race, colored all the mythology of the Paiute. In those happy days all the animals were gods. The Paiute admitted that the howling wolf of his day was a pest. But the first wolf of his line was a god.

Such was the zoötheism of the Paiute. Its religion was sorcery accompanied by incantations, dancing, fastings and feastings, bodily torture, and ecstaticism. Drugs were used to produce an ecstatic state. Paiute medicine men were subject to visions and dreams which they interpreted to regulate the actions of the tribe. Portions of an even older savagery were evident in the Paiute belief in special deities who made their homes in caves and springs and cañons. Every tribe worshiped its own especial tribal god. Each Indian had a personal god whose

identity was carefully concealed from every one lest some one else should seek to win his favor and reduce his efficacy by diverting his attention.

The Paiute philosopher constantly confused objective with subjective. He was a primitive and he saw, heard, smelled, tasted and felt the imaginings of his own mind. He classified purely by obvious resemblance—by analogic characters. He did not search for the essential affinities—the homologic characteristics sought by the civilized philosopher. The Paiute simplified matters by discovering will and design in all things. He inductively explained the cosmos.

The Paiute philosopher was a very positive man. He knew everything except the whims of his gods. Anything else the Paiute could explain. He had so many things to explain that he kept his gods busy producing manifestations of their existence. The heavens, for instance. The Paiute knew nothing about astronomy but he could explain the sun, moon, and stars. His gods ran them. Shooting stars were the excrement of dirty little gods. The Paiute had the same trouble around camp with his own unmannerly little brats.

The Great Basin Paiute lived surrounded by weird, unearthly beings. They lived in the air above him and in the ground beneath him. They were in the trees, below the surface of the water, in caves and niches in the rock, on the plains and high in the mountains. The *U-nu-pits* were the commonest of this host of evil spirits. Most evils and mishaps were attributed to the activity of the *U-nu-pits.* They made their homes in the high cliffs and searched the deserts for foolish and unwary people, whom they carried off to toss off the brink of some high cañon wall. No Paiute ever slipped off a high trail to his death solely as a result of his own carelessness or because a rotten path had crumbled beneath him. To the Paiute mind it

Photo by Walter Fiss

YELLOW HILLS NEAR FURNACE CREEK

was clear that the man who fell had been tripped by a *U-nu-pits,* or that a *U-nu-pits* had prepared the trail to trap him.

The *Yan-tups* were the evil spirits of the springs. They lived in the ground around the subterranean sources of the mountain waterholes. They came out of their deep hiding-places at night and sat on the surface of the water singing in low, doleful voices. They often seized little children who went to the springs for water and carried them off to hidden caverns. But the principal activity of the *Yan-tups* was making people sick. The *Yan-tups* still dwell in many of the springs around the Death Valley country. The white man calls them Epsom Salts or Glaubers' Salts or Arsenic.

The *Pa-o-has* were half women and half fish, who lived in the lakes and floated on the water. They were very beautiful to look upon but they had wicked hearts.

Little mountain spirits called *Kai-nu-suvs* lived deep in the rock recesses of the high mountains. They were kindly spirits, as beautiful as sunset clouds and as white as snow. When the clouds gathered over the mountains the *Kai-nu-suvs* climbed upon the fleet deer and the bounding sheep and drove their swift chargers in wild rides among the rocks. The Paiute cherished these kindly spirits. Whenever he killed a deer or sheep he always cut off a choice piece of the meat and left it for the lonely *Kai-nu-suvs.*

Living surrounded by a myriad of esoteric creatures, the Paiute constantly received signs and portents from the spirit world. He was bid to do this task. He was beckoned along this trail to happiness. The Paiute knew that some of the spirits were most friendly, but others he suspected of luring him into danger. What sign was a warning? What good portent was a snare? The poor Paiute was ever in unhappy doubt. He had no confidence in the accuracy of his interpretations of the

ghostly signals. He yearned to possess the keen perceptions that had so unfailingly guided his ancient forebears.

Major Powell observed many instances of the mental anguish the Paiute suffered under the attacks of the spirit world. In the fall of 1872 Major Powell and his party were camped near a water pocket that was known to the Paiutes as Witches' Hell. Six or eight Indians who accompanied the Powell expedition made their camp on the edge of the general camp. One evening Major Powell joined the Paiutes and was sitting among them at their fire, studying the conjugation of some of their verbs when all conversation was suddenly hushed and the Indians gazed about into the darkness in great terror. Major Powell asked what the trouble was and the Paiutes motioned him to silence. After a moment the chief of the party snatched his pistol from its holster and fired it into the air. Another Indian shot arrows into the darkness. Others took ashes from the fire and scattered them to the wind. All the Indians violently expelled their breaths as though to prevent the approach of some one by their blowing. Major Powell waited until the Indians had quieted down and resumed their places about the fire and then again inquired the reason for the excitement. The Paiutes replied that they had heard a *U-nu-pits* approaching. Fortunately, they had heard it in time. They had been able to drive it away. The *U-nu-pits* did not like fire or ashes.

A few nights later while the party was still encamped at the same place, the chief of the Indians complained of a bad headache. He had *U-nu-pits* in his head. One of the other Indians rubbed the afflicted head with ashes, filling the sufferer's hair with the dust. Prolonged gesticulation, violent puffing and blowing and plenty of ashes finally drove the *U-nu-pits* away. The chief said that the pain in his head had ceased.

The Paiute did not understand that disease or sickness was a state of the body. He attributed all illness to the presence of an evil spirit that had entered the body of the sick person. Instead of using remedies or medicines the Paiute resorted to incantations and ceremonies to exorcise the demon within the body of the patient.

The Paiute did use sweat houses in treating colds. The sweat house was the usual conical hut of the Paiute, covered with earth and well sealed. Steam was produced by throwing hot rocks into a vessel containing water. The patient sat within the sweat house with the steaming vessel between his legs and with a heavy robe thrown over both him and the hot water vessel. An attendant replenished the water and furnished hot rocks. After a thorough steaming the patient sometimes plunged into cold water. The Paiute broke up so many colds in his sweat house that he decided that the *U-nu-pits* did not like the sweat house. He was chasing a spirit, not treating a cold, and the therapeutics of his cure were involved by sheer accident.

Scarification was an excellent method of expelling the evil spirits from a sick man. The medicine man was the operator. He was surrounded by a circle of Indians who gave vent to lusty incantations during the operating ceremony. The medicine man, and occasionally an assistant, made a series of rude incisions down the back, and along the arms, legs and sides of the patient to the accompaniment of the howls of the Indians around them. The theory of the scarification treatment was that the *U-nu-pits* within the sick man would take alarm at the uproar in the tent and escape from the patient's body through the numerous and freely bleeding incisions. Paiute lore demanded that the operating knife be of black obsidian and the operators continued to use their crude native knives in all

scarification treatments even after the Indians began to carry sharp steel weapons.

The *U-nu-pits* fear of fire made live coals a very popular remedy for disease. The medicine man placed live coals upon the flesh of the patient and kept the coals aglow with his breath until a frightful sore was formed. The standard treatment with the live coals usually began at the nape of the patient's neck and a line of fifteen or twenty blisters was burned down his back for the length of his torso. If these burns failed to frighten the *U-nu-pits* away, the medicine man seared the patient with more live coals placed at four-inch intervals down the outside of the arm, from shoulder to hand, and in very obstinate cases, along both legs from hip to ankle. If the patient did not improve after one complete treatment, he was burned again and again. The Paiute who survived the fire torture proudly exhibited the hard callous of the healed burns. They were medals for fortitude in assisting the medicine man to defeat the *U-nu-pits*.

Paiute medicine men had other means of driving evil spirits from the bodies of the sick Indian. Major Powell saw very sick Indians absorb a great deal of physical abuse as the medicine man labored with his patients. Powell was careful to display no lack of faith in the Indian curative ceremonies and was able to attend the rites intended for the eviction of the evil spirit. He saw patients rolled about on the ground in the dirt and ashes of a fire; others were given great bear hugs in the arms of the medicine man as he exerted all his strength in an effort to squeeze the *U-nu-pits* from the limp body of the sick man. The medicine man jumped upon some of his patients with both feet. He knelt upon others and kneaded their stomachs with his hands. He beat his patient with clubs. He picked a sick Indian up bodily and slammed him heavily to the

ground. All the treatments of the very sick were ceremonious with a crowd of Indians in a circle about the medicine man and the patient. Every Indian present chorused the chant of the medicine man as that hard working individual yowled and screamed through a long repetitious series of acrobatic contortions as vigorous and exhausting as his treatment of his diseased victim. If the disease resisted all the curative efforts of the doctor and his assistants the tribe took its revenge upon the evil spirits that refused to be frightened away. The incurable invalid was slain. Let the *U-nu-pits* try to be comfortable in a corpse.

The Paiute office of medicine man or tribal doctor was not cloaked with the esteem or splendor that many Indian tribes wrapped around their physicians. The Paiute submitted to the brutal ministrations of his doctor, but he demanded relief from his sickness in recompense for the sufferings he endured undergoing the cure. If a doctor announced that a sick man had been delivered from the *U-nu-pits* and the patient later died, the doctor often trod upon his heels going into the hereafter.

When a number of the sick died under the doctor's hands the relatives of the dead became incensed against the doctor. They believed that the doctor and his medicine were too weak and they began to organize a group to slay the medicine man. The organizers of the group never baldly stated their intent to remove the doctor. They usually appointed a spokesman to sound out prospective recruits in the oblique manner that was tribal custom. The spokesman approached a selected friend of the dead and said, "Many of the tribe are sick. The medicine of Two Horns is weak against the *U-nu-pits*. There are many *U-nu-pits*. How many arrows have you?"

If the friend replied that he had no arrows he made it perfectly plain that he would take no part in killing the doctor. One arrow indicated that he was willing to help that much;

two arrows that he was a little more willing; and ten arrows expressed his enthusiasm for the idea. When a sufficient number of friends had been rounded up to make the committee strong enough to overcome any magic the doctor might direct at it, the committee called upon the doctor and killed him. Nothing was done to punish the murderers. When faith in the medicine man was gone it was time for the medicine man to go. A new Paiute physician was elevated to the post of tribal doctor. All his friends wished him luck.

Very often the vengeance committee was formed before the sick were dead. Relatives of a sick man became convinced that the invalid could not recover and formed the group of executioners. The doctor was dead almost as soon as his patient. Some Paiute tribes limited the doctor to three losses and the doctor automatically forfeited his life after his third patient died. In other tribes any false prediction by the doctor was to his discredit. If the doctor abandoned hope for a patient and said that the patient would die, and the patient recovered, contrary to the doctor's prophecy, the doctor was in a very awkward position. The tribe did no rejoicing in welcome to an unexpected convalescent. The tribe turned wrathfully upon the doctor, who obviously did not know his business. Many of the Paiute doctors died very young.

The rewards offered by the Paiute medical profession attracted no volunteers to the ranks of the healing clan. Paiute doctors were born into the profession, or they were apprenticed to it when they were too young to protest. Few of the Paiute doctors were happy. They lived just a little too close to their futures.

The Paiute custom of ending the blundering careers of unsuccessful doctors caused grave trouble after the Indians became the wards of the United States government. When epidemics

began to sweep through the tribes the Indian death rates leaped up, and as the deaths mounted the numbers of the Paiute doctors declined. Government workers among the tribes were astonished by the number of unaccountable deaths of perfectly healthy Indians. The government men finally learned that the tribal doctors were being slain because the *U-nu-pits* of the white man declined to be frightened away by the antics of the medicine man. Paiutes down with pneumonia strangely died after a full hour of catch-as-catch-can wrestling with the earnest medicine man.

The government made determined efforts to end the murdering of the medicine men. The Paiutes were told that they must not kill their doctors. The Paiute doctors thought well of that idea but the rest of the Paiutes thought it was silly. The doctors were letting their friends die. The Paiutes had always killed their doctors when the medicine was weak. How could they protect themselves from careless or lazy doctors? The Paiute continued to remove his doctors. Then the government told the Paiute that there would be no more Paiute doctors. As the doctors themselves were the only Paiutes who voted in favor of this radical step, the Paiute retained his tribal doctors. The medicine men of the eighties went heavily armed with the guns of the white men and another twenty years went by before the Indian doctor was wholly safe from tribal vengeance. By the time 1900 came along the corrective education of the Paiute had progressed far enough to convince him that the *U-nu-pits* of the white man were more readily banished by the magic of the white medicine man. But as long as the Paiute tribes maintained their identity as tribes they had their tribal doctors. And the doctors were subject to sudden death sentences.

Death was not a matter of great moment to the Paiute. Life itself was such a problem to the Paiute in his native condition

that he did not consider death an occasion worthy of any great ritual. The friends of a dying man gathered about him to wail their polite grief at his passing and after he had left them they gathered up his bow and arrows and lashed them to his body. He would need hunting weapons in the hereafter. If the dead man had possessed a horse, it was slain and its skin used as a shroud into which the deceased was sewn. All personal belongings were gathered and placed about the body when it was buried in a grave among the rocks.

The death of such great personages as a chief of council or a well loved elder was a cause for wider, more hysterical lament. The people shaved their heads and burned the hair and rubbed dust into their heads as a mark of mourning. The dear friends of the dead cut deep gashes in their flesh and gave vent to their sorrow by bleeding profusely throughout the camp.

The Paiute had a variety of notions about where he went when he died. Some bands believed themselves destined for the good hunting grounds of the west. Others expected to spend the hereafter in the sky. Some did not know where they were going, but many had very definite lands for their spirits.

Na-gun-tu-wip was one home for Paiute spirits. *Na-gun-tu-wip* was reached by an underground passage that held danger along every foot of the way. Even the dead Paiute was not free from the denizens of the spirit world that had plagued him all through his stay on earth. The witches and spirits baited and tried the courage of the luckless Paiute spirit as it moved slowly through the perils of the passage that led to the land of the dead. The damp sands of the long foul cavern, through which the Paiute spirit struggled, bore the tracks of gigantic animals. Horrible growlings echoed through the vast vaults of the cave. Monstrous birds flew ponderously about the rocks

overhead and added their hoots and screams to the menacing din. Only the brave survived the ordeal of the long cavern. Many spirits of the departed were terrified by the horror of what they saw and heard and ran back in panic to wander over the face of the earth—cowardly ghosts, despised by gods and men.

Braver spirits emerged from the far end of the dark cavern into bright sunlight. At their feet was a bottomless chasm and beyond the chasm they saw a luxuriant valley more beautiful than anything on earth. Spanning the chasm was the most fearful trial encountered by the ghostly traveler, a narrow ledge of rock, much, much, narrower than any ribbon of cliff trail the Paiute had ever followed during his life on earth. At the other end of this awful bridge was the heavenly land of *Na-gun-tu-wip,* ruled by the godly *Shin-au-av,* and a group of the comely daughters of *Shin-au-av* stood at the heavenly end of the bridge and beckoned and encouraged the faltering ghost to attempt the last test of his courage. If the spirit courageously walked upright across the dreadful span he was greeted with excessive demonstrations of joy. The comely daughters of *Shin-au-av* were lavish with their favors. The Paiute had reached his heaven.

There was no toil within the marvelous valley of *Na-gun-tu-wip.* Food was abundant. The stores of food and drink brought to the home of the departed spirits by the first *Na-gu-nu-ints* had been used for long ages but they had not diminished. The basket of pine nuts standing in the lodge was always full. The supply of cactus wine was inexhaustible. There was no want, no pain, no sorrow. The people filled their days with feasting and dancing. And there were the daughters of *Shin-au-av.*

The Paiute had no concrete notion of hell, except the hell he knew on earth. To hell in that degree he consigned the spirits that lacked the courage to pass the ordeals of the long

underground passage and the narrow bridge along the road to *Na-gun-tu-wip.* The Paiute believed that all cowardly spirits wandered the earth as slinking ghosts. He lived his life surrounded by ghosts and demons, and feared that in death he might be added to the hosts of these despised earth-bound spirits and never know the joys of a luxurious spirit life. The Paiute knew that certain actions in his life would surely cause him to be transformed into a witch when he died. He was careful to avoid these known perils.

One of the most certain methods by which a Paiute guaranteed himself a place in the ranks of the witches and *U-nu-pits* was to live too long and become a burden upon his friends and his tribe. As the years grew heavy upon the Paiute man or woman he or she wandered off from the tribe to a voluntary death by starvation. The greatest of the Paiute chiefs refused to become a care to their people and found death through the slow process of starvation.

A Paiute woman commonly believed that great age doomed her to become a *U-nu-pits.* She should die soon after she was no longer able to bear children. If she lived much beyond her fruitful period she was pledged to perpetual life in a snake skin. Suicide was prevalent among the older Paiute women.

Major Powell once rode into a deserted Paiute camp. Three old Paiute women sat around a tiny fire gazing into its flames in silence. The three women paid no attention to Powell's approach and ignored his presence as he sat on his horse at a little distance from them. The three women arose, supporting themselves upon their staffs and began a shuffling dance in a circle about the fire. They chanted a dance. The dance and chant lasted for half an hour. Then the three sat down. Later they arose again and danced and sang for another half hour. Again they sat down to gaze into the fire. The scene and the

Photo by Walter Fiss

LOST VALLEY AND THE AMARGOSA RANGE

chant made a deep impression upon Major Powell. He writes that the scene and actions of the women and the quavering song they sang were wild and weird. He wrote down the song as best he could and rode on. He left the women alone by their fire.

A few days later Major Powell overtook the tribe to which the three old dancers had belonged. He learned that the three women had remained behind to starve to death. The tribe thought their act highly meritorious. Major Powell brought out the phonetic transcript of the song the old women had sung while he watched their dance. He got a translation of it:

Alas! Alas! Alas!
Here long enough have I walked this earth.
Here long enough have I walked this earth.
Enough! Enough!
Let me die! Let me die!

Instances of cruelty to aged men or women of a Paiute band were entirely justified by the Paiute creed and the circumstances under which the Paiute lived. The Paiute respected old age. The elders of a band were treated with a kindliness and consideration approaching reverence. But every Paiute knew that too great an old age marked the old one as a potential witch or *U-nu-pits.* That, however, was largely a personal matter. The Paiute had so many spirits and ogres already hampering him that a few more would scarcely be noticed. Tribal action became necessary in the cases of obstinate Paiutes who lived as a burden to the tribe, instead of leaving the band and seeking death decently. The Paiute scheme of living had no room for those who impeded the movements of the tribal group and ate the food some one else had gathered. People of this sort were a menace to the security of the entire tribe. These aged ones required stern measures. They were abandoned to starve.

The Paiute mind saw nothing cruel in the abandonment of the old ones who did not seek death themselves. To the contrary, the action was a good deed. The tribe benefited, and the person left to starve was saved from the *U-nu-pits*. There was one less mouth to be fed by the already busy hands of others and the unwilling victim was given an even chance to win to the beautiful valley in the land of the dead.

The many scattered bands of Paiutes all had myths of the creation of their race. The Paiute knew all about the birth of his race and its propagation. Paiute babies were born in the usual length of time. Two months were required for the creation of a Paiute baby. During these two months each part of the body of the child was separately conceived as the result of a distinct act. Of course, in the old days, the ancient Paiute had offspring after having known his wife only once. But those were the days of miracles.

The ancient Paiutes were the miraculous work of the Paiute gods. The first Paiutes had fraternized with the gods. Their close association with their omnipotent creators had endowed them with the godly attributes of knowledge and wisdom, strength and agility, fortitude and daring. The Paiute knew that the first of his race were more widely intelligent than he was, and possessed talents that were far superior to his own. The Paiute race had declined from the stalwart Paiutes who were the children and comrades of the gods. The Paiute race had declined so far by the nineteenth century that the Paiute father of a new-born child was unable to eat meat and went to bed for twenty-two days.

In the beginning, the water was everywhere. Then the buzzard lifted the sky and the water ran to the west and made the ocean. Then the buzzard made the trees, the plants, and all the tribes, and all the animals. And the grizzly, the badger,

and the gopher, fearing that the water might come back, made the mountains with their hands.

The buzzard still controlled the winds. Four gods who looked like birds lived outside the sky and blew through the cracks when the sky was lifted by the buzzard. The lesser desert whirlwinds were caused by pigmies:

> In the land of the Pigmies
> There was a strange sight.
> From mountain to mountain
> A bowstring was stretched.
> And a line of dust rose
> Where they danced.

The home ranges of the Paiute contained great cliffs thousands of feet high, that stretched for hundreds of miles. Often these cliffs were the edges of high plateaus or mesas. The mesas were traversed by deep gorges, and the mountains were cut by precipitous cañons with stream channels hundreds of feet down in the rock. The Paiute assumed that the entire earth was formed like his own country and he was sure that the earth had definite limits. Any Paiute who traveled beyond the sea to the west could climb to the level of a broad mesa and cross the mesa to its further edge and there peer off into the western end of the world. The rocks on the brink of the world's edge were very treacherous. Paiutes who were too curious had fallen off the edge of the world. When had anyone fallen off? Long, long, ago. Where did they fall to? The Paiute did not know. It was the edge of the world. Those who fell off did not come back to tell where they fell.

The middle of the Paiute world was in northern Nevada. Its eastern edge was a line of cliffs like that to westward. The Paiute world had no northern or southern boundary. The Paiute saw no necessity for a northern or southern end and to

all questions about them he replied, "The ancients never told us about a north and south end to the land." If the ancients had lived with the gods in a land with only two ends the Paiute would get along in the same land.

The daily passage of the sun influenced the Paiute mind in accepting the earth with two edges. The Paiute knew that there had been a time when the sun was free to jump all over the sky. There had been trouble about that. It all happened when the gods were living on the young earth with the first Paiutes. The gods had laid out a regular route for the sun, after the sun and *Ta-vu,* the rabbit god, quarreled and almost destroyed the earth.

In the ancient days when the sun wandered around the heavens at will it had gently warmed some portions of the earth, destroyed other sections in flames, and left some areas frigidly cold. One day while *Ta-vu* slept by his fire the sun poured its heat down upon him and almost killed him. *Ta-vu* awoke from the terrible heat and cried aloud in his anger at the sun. The sun feared *Ta-vu* and fled to a cave beneath the sea.

Ta-vu was very angry at the sun. He knew that the sun feared him because he was a powerful god, and decided that the sun had tried to burn him up. *Ta-vu* made the long journey across mountains and deserts until he stood upon the cliffs at the eastern edge of the world. With a magical bow and a quiver of magical arrows *Ta-vu* waited for the sun to come out of the cave that ran under the earth.

The sun crept out of the cave and rose to the edge of the cliffs. *Ta-vu* let an arrow fly at the face of the sun. But the heat of the sun consumed the arrow. *Ta-vu* shot his arrows as fast as he could string them to the bow but none of them survived the great heat of the sun. At last *Ta-vu* had but one arrow left and he said, "This arrow must not fail." And he

thrust the arrow point into his eye and wet it with his tears. *Ta-vu's* last arrow, wet with his tears, struck the sun squarely in the face; and the sun burst into many more pieces than there are stars and fell all over the earth to cause a terrible conflagration. The earth was afire. Great floods of flame rolled down the burning mountains and the rocks were all aglow.

Ta-vu fled before the destruction he had caused and as he ran his legs were melted off, and his body was scorched brown, and his eyes gushed tears. Tears flowed from his eyes in such quantities that they formed a great flood that covered the burning land and quenched the fires.

This terrible disaster brought on by the feud between *Ta-vu* and the sun made the desert country what is is to-day. It also alarmed and angered the rest of the gods who at once summoned *Ta-vu* and the broken sun before them as they sat in council. The quarrel must be settled. *Ta-vu* they swore to keep the peace. And the gods told the sun that he would have a regular path across the sky and could use ten caves beneath the earth to travel from west to east. These ten caves the sun would share equally with the moon. The council of the gods warned the sun that there must be no trouble between the sun and the moon. And to this day there never has been.

The simple myths related seventy years ago by the Paiute have grown into a series of codified legends which are almost too beautifully complete. These elaborate legends now current have been expanded to their detailed perfection by later genrations of Indians, who discovered that the white man, with all his wisdom and mysterious equipment, had less knowledge of the simplest phases of Indian history than the stripling *Nuints* playing about the camp. The powerful white man was anxious to hear Indian legends. He came and sat at Indian feet to learn, not the wisdom of the Indian elder, but the elemental

truths taught to Indian children. Indian pride of race was great. Twenty years of association with the white man taught the Indian to lie easily and fluently. Many of the legends of Indian creation now being circulated originated in the active imagination of the Indian narrator as he satisfied his colossal ego at the expense of the student of Indian mythology. The legends told by the later day Indians are a long way from the simple creeds taught over the camp fire of the winter evenings one hundred years ago.

The aboriginal Paiute was not altogether the low brute that some observers have described. Almost as soon as the white man encountered the Paiute and his Shoshonean cousins he labeled them Diggers. Stories spread that the Digger was close to the wild beast. He even spent his winters holed up in a semi-torpid state. The Paiute supported life in a manner that was revolting to many members of the more fastidious white race. The Paiute lived in the Paiute range lands. White men and women died of thirst and hunger in the Paiute range lands.

The Paiute was humble. He was low in the cultural scale. He had none of the adventures of his famous warrior cousin, the Comanche, but the same blood strain and stamina helped him to conquer his barren, inhospitable lands in the unending battle for existence. When Paiute leaders decided that war was necessary, his courage and racial pride sent him to war, even against the powerful white. His life was dull and colorless in contrast to the life of other Indians, but it did not entirely sour the Paiute's disposition. He even managed to extract some amusement from it.

The adult Paiute always had his gambling games to turn to in his spare moments or he could indulge his ribald sense of humor in the broadly Rabelaisian practical jokes he loved so well. Younger Paiutes amused themselves in the manner of all

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THE AMARGOSA DESERT AND THE BULLFROG HILLS

youths. They walked upon stilts, held archery contests, ran foot races and vied in jumping contests and various feats of strength.

One of the most popular games of the Paiute youth entertained the elders as well. In this game the fleetest of the boys impersonated a deer or mountain sheep, and the remainder of the boys were dogs. All contestants were required to run on their hands and feet and the game was restricted to the immediate vicinity of the camp, so that the audience of elders would miss none of the sport. The pursuit sometimes lasted for hours, with the deer and the dogs scampering around the camp to the shouted encouragement of the spectators. When the dogs overtook their prey, the deer received rough treatment. The dogs had no means of holding the deer except with their teeth, and the deer wore no clothes to protect him from their bites.

In pleasant weather the Paiute camp was a scene of constant hilarity among the smaller children. Rope swings braided from the fibers of the Joshua-tree swung dizzily. Dolls and images of fire-burned clay were numerous. Toys, trays and imitation baskets were manufactured from clay by the youthful potters, and toddling artists cut the inner bark of cedar trees into little strips and painted the strips with crude representations of human figures.

The games and playing about the camp ended with winter's arrival. The almost naked children suffered in the winter. Even Death Valley did not shield them from chilling temperatures at night. Coughs and colds became endemic and the children, not at all their gay young selves, huddled around the fires with eyes watering and noses running. They longed for the warmth of summer.

The life of a Paiute maid was bright and happy until the

heavy labors of camp and trail, that became her lot as a wife, and the pains of motherhood, cut deep wrinkles and broke her down physically. Her spirit, too, was broken before many years and she became garrulous, cross and scolding. Soon, she must die. The *U-nu-pits* were waiting.

The Paiute was not lacking in intelligence, but the perceptive qualities he had developed were those most necessary to his method of living. As a great hunter, the Paiute was a skillful tracker. Few signs of the trail escaped his eye. Major Powell was riding along a trail with a Paiute companion when the Indian pulled up his horse to examine some tracks in the dust. He turned to Major Powell and said, "Three Indians passed this way this morning. An old man, a woman, and a boy."

Major Powell saw only three or four moccasin prints in the sand. He asked, "How do you know? How can you tell an old man passed?"

The Paiute got off his horse and put his finger in one of them. "This is the old man." He pointed to another print. "This is his track again, and again." He indicated the irregularity of the length of pace and said, "An old man walks so. A young man walks regularly."

"How do you know a squaw has passed?"

"By the shape of the moccasin."

"How do you tell the squaw from the boy?"

"The squaw has followed the trail and her moccasins are a different shape." The Paiute led his horse a few rods along the trail and stopped and pointed to the ground. "Here, the boy tried to shoot a chipmunk."

Powell was openly skeptical of this reading of a few footprints in the sand, but the Paiute showed him where the boy had left the trail and illustrated how the boy had placed his feet as he drew the bow and shot the arrow. Powell was

curious about the Indian's ready identification of the animal as a chipmunk. Powell said, "I think it was a rabbit."

"*Kuch!*" exclaimed the Paiute. "No rabbits here at this season. This is not the place for rabbits. Rabbits live down in the brush; chipmunks live here!"

Major Powell could not refute this argument and was still thinking of his own ignorance a few moments later when his Indian remarked, "These three Indians passed here when the sun was there." He indicated the sun's position at eight o'clock in the morning.

"How do you know that?" Major Powell was now decided to get the lesson all the way to its end.

"The wind has not blown the sand into their tracks," the Indian explained. "Last night the wind blew. Had they passed here yesterday there would be sand in the footprints. Had they passed early this morning the chipmunks would have walked on their tracks. Chipmunk walks around early in the morning. Stays up only little while. He is now in his wickiup."

The Paiute mounted his horse and rode beside Major Powell as he completed the story he read in a few tracks beside the trail. "Old man, woman and boy have gone to glean in the Mormon's fields for wheat. The Mormons are now cutting their wheat. The Indian corn is not ripe. The Paiutes have very little to eat. They want wheat very much. I think they have gone to glean in the Mormon fields."

The arrival of the white man destroyed all the old Paiute ideas about life. The lands which had always been Paiute lands became the white man's lands by right of occupation. Strange habits and customs, strange food and clothes were all around the Paiute. The white man controlled many mysterious powers that worked for him. He carried war instruments that killed his enemies at great distances. There were so many

things about the white man the Paiute did not understand. The Paiute's intelligence was not equal to the task of analyzing his position and readjusting his life to the new conditions which he must meet if he were to survive. His philosophy and religion which had always guided him gave him no hint of what to do. It was written that his race must go. But his heritage of the lands and his pride of race did not permit him to yield without a struggle. He held fast to his homelands and continued to get his food from them. And when this gathering of food on the Paiute lands involved what the white man called theft of the white man's cattle, or trespass on the lands the white man considered his lands, there grew up a bitter hatred. The hatred ripened into war.

The battle grounds of the Indian wars never included Death Valley. The white man did not covet the hot valley of death. The miners and valley Indians sniped at each other and there were a few scattered casualties, none of which had any bearing upon the prolonged conflicts, eastward in Nevada and in Owens Valley to westward. The Owens Valley War was a serious disturbance. It began in 1861, during an unusually severe winter, when the hungry Paiutes appropriated cattle they found in the hills. The settlers of the Owens Valley district were facing a food shortage and could not afford to lose any stock. Intending to discourage the theft of their cattle they shot a few Indians. They succeeded only in decreasing the security of their lives, because the Paiutes replied to the killings by going to war. The Indians made up in numbers what they lacked in arms and within six months the Paiute was occupying all of Owens Valley.

Three months later the defeated settlers resorted to a diplomatic adjustment of their difficulties with the Paiute. An armistice was arranged and a peace effected at a parley with the

Photo © by Walter Fiss

WINTER SUNRISE IN DEATH VALLEY

Indians. There was nothing permanent about the peace. The peace did not satisfy the Paiute's hunger. When the Indian got hungry he poached upon the white man's herds. The white man protected his cattle. The war was on again. Isolated wagon trains were raided. Villages were plundered. Indians were massacred. The raiding Paiute was a constant threat over the lands from which the settler had to obtain his living. Soldiers were brought in to assist the settlers. It was 1870 before the Paiute was forced to realize that he could not fight the white man. He had tried hard in a series of outbreaks that extended through nine years.

The fighting between the Paiute and settler on the Paiute lands was never a war between great forces. It was more a series of plundering Indian raids and guerrilla reprisals by the white. The total casualties for nine years did not exceed three hundred; of these two hundred and fifty were Indians. The Indian troubles of the early Owens Valley settler were serious enough to the settler. He had only infrequent and unreliable means of supply and communication and the usual vacillating governmental support. The Paiute was not so well off. He saw his lands occupied by a new race and the conviction was slowly borne to him that he could not hope to overcome these people who had absorbed his range lands. The Paiute lands were gone. Soon the race would go.

There are perhaps a hundred Paiutes in the Panamint and Amargosa Ranges and in the lands about Death Valley. Some still winter in the cañons after they have made the old, old harvest of the pine nuts. Some run trap lines in the hills. Each winter finds them camped near good water with their string of traps cutting the fox, western cat, swift, and coyote off from water. Fox pelts bring from ten to twenty dollars. The Paiute who owns a few burros is glad to increase his income by pack-

ing miners' supplies up to inaccessible prospect holes. The squaws make baskets to sell to the tourists.

Many Paiutes and Indians of mixed bloods are residents of the towns on the borders of the Death Valley region. Some of these second- and third-generation Indians under white rule were born very tired, but others are very useful persons who have taken their places in the crafts of the towns. Where ambition was present, the Paiute has made a good workman in the mines and on construction projects. A good proportion of the Indians are self-sustaining and on their way to independence. The reservations are open to the Paiute. The Paiute is not fond of the reservations.

Few of the present-day Paiutes know anything of the early history of their tribe or even of more recent events in the tribal organization. The organization itself has been dissolved and the units scattered. The verbal instruction that was the Indians' education in things that were purely Indian no longer exists. The intelligent, educated Paiutes confess that the few Paiute wise men who still live refuse to answer questions about ancient or recent Paiute history. When ties of blood will not lead the Paiute elder to explain things to the new generation, the white investigator can scarcely hope to break the elder's silence. The old Paiute says he knows nothing.

There are picture writings all through the Death Valley region, preserved on enduring rock surfaces. Many of these pictographs are simple pictures—rude etchings or paintings delineating natural objects, especially animals—and are merely illustrations that indicate the beginning of pictorial art among the Indians. Other pictographs are accepted by anthropologists as commemorating events or representing ideas that were entertained by their authors. A large amount of this latter division of the pictographs do not convey ideas of themselves. They

are simply mnemonic. They were designed to assist the memory of the writer in remembering events or thoughts that were already known to him through hearsay or tradition. The writer of these pictographs tried to preserve the memory of the thought only, and now that the thought itself has passed from the minds of men, the written record that remains in the pictograph is of no assistance in restoring its own subject matter to the understanding of man.

All along the old Indian trails, the wet trails that run across mountain range and desert waste, there are pictures. Mile after mile there are indecipherable guideposts. How long ago were they carved? Who carved them? Some of them are clearly Indian in character, portraying not only natural objects but also the representation of the gesture signs that were part of the vocabulary of gesture speech. Other carvings found with the Indian pictographs differ from them by the use of more or less conventional characters quite similar to those found in Mexico and throughout Central America. There is strong belief in some quarters that the writings in Marble Cañon, in the Panamint Range, and in Forty Mile Cañon, in Nevada, were carved by a race that is yet to be identified. These pictographs exhibit the beginning of written language and the beginning of pictorial art unidentified. The study and coördination of these writings is now engrossing anthropologists, and from them and from other related writings scattered over the mountains and valleys of the southwest, there may yet be written one of the most interesting chapters in the early history of mankind.

LOST EMIGRANTS

It was September, 1849. The desert lands of the Great Basin were slowly cooling after a burning summer in the sun, cooling as slowly as though the desert was one immense heat of metal poured and left to cool. In a broad Utah valley set deeply below bare buttes and carved peaks, ten Paiute Indians camped. They camped at a waterhole close to the base of a waterworn cliff. It was the only waterhole in the great desert valley. Two scouts in advance of a pioneer wagon train peered down upon the Indians from the safety of the cliff above the water. The scouts had been at the waterhole. They had seen the Indians first.

Night filled the valley with darkness that became thin and gray in the light of the low-hung stars. The Indian camp fire at the waterhole was a brilliant yellow light in the night. The Indians danced slowly around the fire. Their long shadows spun slowly like the spokes of a great wheel around the hub of the fire. The Paiutes chanted in time to their broken dance. The clean, lithe bodies moved darkly through the splashing orange flames. Over and over the Indians sang:

Tu-gwi-nur-ru-a tu-wip
Un-kar-ti-si a-vwi-mi-ni.

The two scouts withdrew from the top of the cliff. They rejoined the pioneer wagon train that was moving into the desert. They said they had found water. And they had seen some Indians dancing and singing a wild, unintelligible song. They did not know they had heard the Paiute Desert Song. They had not understood its warning. Again and again the chanting Indians had warned them:

The land is hungry
The ants are starving.

CHAPTER FOUR

LOST EMIGRANTS

THE first white men who penetrated the Death Valley region and left any record of their adventures within its wide, sunburned wastes were members of an emigrant party of 1849. They did not enter Death Valley intentionally. They were on their way from the Middle Western States to the gold strikes of California; and they were in a hurry. They had been in a hurry for six months. They came across the transcontinental trail hurrying on foot to the slow, slow beat of their creaking ox-drawn wagons. They reached the last outpost of civilization at Salt Lake City in July, 1849. They could go no further into the desert while it vibrated in the heat of the summer sun. They waited for the cooler weather of fall which would permit them to attempt the passage of the desert, and as they waited they fumed in their impatience to be gone. Other men were already in California. Thousands of other men were ripping the gold from the ground. Even the Chinamen were tearing the treasure from the earth. Ships were speeding around the Horn loaded with gold seekers. There would be no gold claims left. Damn the weather and the desert! Would it never cool off, so that they could be gone along the trails to the gold fields?

The precious days slipped by into weeks and months, and the van of the westward bound Forty-niners in Salt Lake City saw their numbers swelled by the outfits and wagons of other gold seekers who came plodding in out of the east. How far

was it to California? How long would they have to wait? Where was the trail to the west?

There was no trail to the west. When the desert was cool enough for travel, the high Sierras were deep in snow. The Donner Party had tried the western trail and spent a winter in the deep snow of the high Sierras. Before the winter was out some members of the Donner Party starved to death. Better not go west. Better go south to the old *Santa Fé* trail that the Spaniards and Indians had been following from old *Santa Fé* to *El Pueblo de Nuestra Señora La Reina de Los Angeles* for hundreds of years.

The emigrants found a Mormon guide named Captain Hunt, who knew the *Santa Fé* trail. He would guide them through to Los Angeles for ten dollars a wagon. No wagons had ever been over the trail, but Captain Hunt thought he could get the emigrant train through. Captain Hunt was a Mormon elder. There were rich Spanish holdings in California. A wagon road from Salt Lake City to Los Angeles would be something the Mormons could use.

In September, 1849, the emigrants moved one hundred miles south from Salt Lake City and halted to complete their organization. The months of waiting were over. They were again moving toward the gold fields. Their old enthusiasm revived and they drew up written articles organizing themselves into the "Sand Walking Company," with seven divisions, each under an elected captain. They called their companies such names as "The Jayhawkers of '49," "The Buckskins," "The Hawkeyes," "The Bug-smashers," and "The Wolverines." They relished the taste of the adventure they were living. They were well organized and strong. One hundred and seven wagons and over five hundred horses and oxen crawled southward in the dust under the urging of the hardy pioneers who walked con-

fidently forward with their heroic women and their children, with all their possessions, toward the riches of the gold fields. Their outfits were in good repair. The horses and oxen were fresh. They were a strong and valorous company.

The great wagon train crawled southward into the lands of the giants. It crept through far-flung valleys toward successive horizons of great ribbed mountains. In the vastness of the country the importance of the wagon train shrank. Away from the clatter and dust of the wagons and the physical shock of their movement, the wagon train was only a wagon train. It was no longer great. It was not even adequate. It was an illy equipped collection of wagons, carrying a handful of courageous farmers who sweated impatiently toward a rainbow and a pot of gold. Ahead of them were the bad lands. The farmers knew nothing of the desert. In high optimism and deep ignorance they plodded on toward the hot brass of the bad lands. A pencil line of dust across the great bosoms of the valleys marked the passage of the emigrant train. One hundred wagons. Two hundred people. Five hundred head of stock. A short column of ants crawled across the face of the world. The gold seekers moved toward the gold fields. They were in a hurry. Step by step they moved south.

Few of the emigrant train had any liking for the southerly direction taken by Captain Hunt, their Mormon guide. The gold fields were west. The emigrants wanted to go west, not south. Before they reached Little Salt Lake, their clamor led Hunt to turn west. They futilely hunted a western trail, until Hunt managed to lead them back to the southerly route. This attempt to find a cutoff to the west precipitated the collapse of the emigrant organization. Men remembered seeing maps of trails to the west. They chattered around the camp fires about maps and shortcuts. They forgot the written articles

with which they had organized the brave "Sand Walking Company," forgot the articles imposing duties and responsibilities they had accepted for the common good of all the wagon train. Individuals began to promote their own vague schemes for getting west with greater speed. When another wagon train headed by Captain Smith overtook them and Captain Smith flourished a map of a shortcut to the Pacific coast, the "Sand Walking Company" split wide open.

Captain Smith's map showed a new route running westward from the southerly trail, which the emigrants were following. It was an alluring map. The camps were marked. The water and grass feed were marked all along the shortcut to the west until the trail pierced a last mountain pass near Owens Lake and emerged into Tulare Valley and Los Angeles. There were long harangues at the camp fires. Why make a long loop to the south to reach a destination to westward? There has been time enough lost already.

Captain Hunt, the guide, listened to the puerile arguments advanced by the blindly enthusiastic emigrants. He warned the emigrants. "How will you cross the mountains in the west?" he asked. "There is no wagon road through that country."

"There's no wagon road in this country," they retorted. "We've broken the trail all the way. We'll get across the mountains. The map shows the trail."

The map. Captain Hunt gave up pointing the hazards of an unknown route. "I know nothing about this new trail," he said. "I don't believe a white man has ever been over it. I think you're wrong to take your families into that country, but, if you all decide to go, I'll try to lead you through. But if only one wagon wants to go the way we started, that's the way I'll go."

Photo by courtesy Union Pacific System

THE BOTTLE HOUSE OF RHYOLITE, NEVADA

When the emigrants reached the fork indicated on Captain Smith's map, only seven wagons continued south on the original trail. Captain Hunt went with them. One hundred wagons turned west along the shortcut. The new westward trail led the emigrants upward through pleasant country for three days, until they reached the summit of a divide, where the trail plunged down a cañon through which the wagons could not pass. For two days the men scoured the country for a cañon which would let the wagons through. They found no pass. The first enthusiasm for the cutoff died. The same critics who had been unhappy with Captain Hunt's route to the south now raised their voices against the new shortcut to the west.

A man named Rynierson spoke up. "It is now the seventh of November. Bad weather is likely any time. I have had enough of this cutoff and I am going back and follow Captain Hunt."

"Good luck to you," said one of the Jayhawkers. "The Jayhawkers are going west on this trail. We'll get through or we'll leave our bones along the way."

West or south? There was heated wrangling in some of the camps. Fighting words passed between old friends. Several knock-down, frontier-rules fights occurred. Partners angrily divided their equipment. Some, unable to complete a satisfactory division of their outfits, sawed their wagons in half. Sixty odd wagons backtracked with Rynierson to the trail along which Hunt was moving south.

Twenty-seven wagons were still in camp on the cutoff when scouts found a way through the cañons. The emigrants took counsel and reorganized. They committed themselves to follow the cutoff. They formed, all unknowingly, what history was to call the Death Valley Party of 1849.

Twenty of the wagons in the Death Valley Party belonged

to the Jayhawkers, thirty-six young men who had come as a unit from Galesburg, Illinois. They were impatient to reach the gold fields. From the moment they had first heard the word cutoff, when they were only a few days out of Salt Lake City, they had been unable to reconcile themselves to a long southern route to a goal almost directly west of them. They had found the long wagon train a cumbersome machine, woefully slow on the trail. They had believed all along that there was a shorter route into the west. They were on that cutoff now. They had found a pass through the mountains while others, less determined than themselves, were retracing the trail back to Hunt's route, or sitting in camp dumbly wringing their hands. The Jayhawkers were entirely willing to do their own trail breaking. They knew they could hit a faster pace once they were on the trail by themselves. They decided that they would not have their speed cut down by the presence of women and children. And they were not going to be bothered by any old women in pants. The Jayhawkers were going west. And they were going alone. They yoked up their oxen and pulled their twenty wagons out of camp. Ho! for Cal-eye-for-nee-ay!

An unwelcome trail companion moved out behind the Jayhawkers—the Reverend J. W. Brier. With the Reverend Brier were Mrs. Brier, and their three small boys, six, seven, and eight years old. The diverse accounts left by members of the Death Valley Party, who wrote of their experiences, are in agreement upon the Briers. Mrs. Brier was a man. The Jayhawkers had told Brier that they did not want him traveling with them. The group of families left in camp on the cutoff, after the Jayhawkers started off independently, invited Brier to join them. Brier declined the invitation and ignored the rebuff of the Jayhawkers. Brier followed the Jayhawkers.

The group of families which remained after the departure of

the Jayhawkers and the Briers formed the Bennett-Arcane Party. In this group were Mr. and Mrs. Asabel Bennett and three children; Mr. and Mrs. J. B. Arcane and their small son; Mr. and Mrs. Wade and three small children; two Earhart brothers and their sons; Captain Culverwell; a man named Fish, another named Gould; John Rogers and Lewis Manly; and four unnamed teamsters: a total of three women, fourteen men and nine small children. Manly, who wrote a story of the expedition forty years later, was the scout of the Bennett-Arcane Party. He ranged free of the slow moving wagons and climbed buttes and pinnacles along the route to observe the country ahead. Manly condemned the northerly direction his party was taking in following the Jayhawkers and the Briers.

"We're going wrong," Manly told Bennett. "I know we are going wrong. We must either turn west or go back and follow Hunt. This trail goes nowhere—unless it leads back to Salt Lake City."

Bennett had enough confidence in Manly to swing the wagons from the trail of the Jayhawkers and head more directly west. The seven wagons crossed gently sloping table-lands and wound through broken hills. There were springs and streams along the way for several days and then the country gradually became dry. Manly, watching from the high places, saw that the land would become more barren with each day's travel. He warned the emigrants that they would encounter rough, waterless country ahead. The emigrants were resolved to continue ahead. They were exasperated by the constant councils which always resulted in a change of plan or route and further delay. A day spent pushing wagons and oxen across broken country left a man little enthusiasm for evenings of argument about how wisely he had chosen the route, along which he had worked so hard all day. The Bennett-Arcane Party pushed

slowly west. A few days later the Jayhawkers came up from the rear, camped with them one night, and then went on out in front of them. The Jayhawkers, too, had abandoned the northerly trail.

The Jayhawkers were still confident that they would be the first into Los Angeles and they were moving at a rate that vindicated their earlier claims of breaking trail faster when they traveled alone. Still in contact with each other, the Jayhawkers and the Bennett-Arcane Party rolled southwest with the feed getting poorer and water becoming scarce. A group of Indians fled before the approach of the Bennett Party. The emigrants captured one Paiute. By sign language they made the Indian lead them to water. They would keep the Indian for a guide. They would force him to lead them to Owens Valley—it could not be far. While the emigrants drank, the Indian slid up a hill and disappeared. The emigrants were to miss that Indian.

Day by day, ten miles a day, the wagons crawled west. They must be nearing the Sierras and Owens Valley. Perhaps the summit of the next range would give them a distant glimpse of California. They were to know many next ranges. More than three hundred killing miles of desert flat, desert mesa, and steep and naked desert mountain chains were spread in a cruel barrier between them and California. Not all of the emigrants would climb to the last far-distant summit and see what lay beyond the final range.

No rain had fallen since the twenty-seven wagons of the Death Valley Party started along the cutoff to the west. The nights were clear and warm and the heat of midday increased with the steadily increasing barrenness of the mountains and the valleys. More slowly than a man could walk, the wagons crept across the desert. Ten miles became a good day's travel. The emigrants were learning to do without water.

Manly returned from a scouting trip. He said, "There are snow-clad mountains to the west. I saw them plainly. First, there's a wide, waterless plain. Then there's a low, black, rocky range, and beyond that the mountains with the snow. I think there is a pass just north of one big snow peak. If it is a pass, it is right ahead on our trail."

They began to call the pass, Martin's Pass. California was at the other end of the pass. They hastened along the trail to the southwest. In their anxiety to reach the snow and the pass, they pushed the oxen and increased their pace. They strained forward for three days. The oxen were burning up under heavy work on dry feed and insufficient water. The oxen were beginning to look badly. But California was not far away.

Manly climbed a tall butte to the south of the wagon train. He looked across the distant Amargosa Desert to the three great mountains of the Amargosa Range; the Black Mountains, the Funeral Mountains, and the Grapevine Mountains; chained northwest and southeast for one hundred and thirty miles along the east side of Death Valley. Manly looked across the Amargosa Range to the higher walls of the towering Panamint Range; and he saw the snowcap of Telescope Peak. The low place, the Martin's Pass of the emigrants, was eight thousand feet up the bald face of the Panamints. Manly did not know that. Manly could not see the deep sink of Death Valley, hidden beyond the Amargosa Range.

California was not far away? Many of the emigrants would not see beyond the last range.

"There is a waterless plain ahead," said Manly. "There is no water for many, many days of travel. I do not think we can cross this next barren plain."

The twenty-seven wagons of the Death Valley Party were

camped together for the last time. The Jayhawkers heard Manly's report on the difficulties ahead. Manly's summary of the dangers ahead spurred the Jayhawkers on. The Jayhawkers staggered forward through five waterless days. They met thirst. Panic struck into their ranks for the first time and destroyed their unity. Martin, one of their members, formed a group of his own and turned south across the desert, to skirt the southern spur of the mountains ahead. The situation of the Jayhawkers was dangerous to life. Waterless, they performed exhausting labor throughout every mile of their advance. Keep the wheels turning. Shoulder to ox-wagon. Heave! They were in a hurry now. They wanted to live.

It snowed on the sixth day. Not much snow. Just enough moisture to relieve parched bodies and send them into the next burning march across the desert. At last, they found water. It was the Amargosa River, charged with alkaline salts. Thirsts such as the Jayhawkers knew were not to be denied water, whatever its bitterness. Man and beast drank heavily of Glaubers' and Epsom salts and other chemicals in solution. It was the first time the Jayhawkers met thirst. They drank and then toiled up through the Amargosa Range. The boulder littered alluvium was a trail difficult enough without the cumulative weakening effects of the salts the Jayhawkers had consumed. An ox died. The Jayhawkers lived through two days of toil and weakness. They reached the summit and were confronted with the terrorsome sight of Death Valley's unwatered sink and bald mountains. They doggedly descended into the valley. They found a spring near Furnace Creek. They drank, and soaked their dry bodies. They camped.

The Jayhawkers had met thirst. They were grim where they had been gay. They were in the worst pocket of country they had ever seen. It was no longer a question of hurrying on

Photo by Walter Fiss

THE SALT BED

through to the gold fields. It was not even a question of saving their wagons and stock and possessions. There could be no more hauling and heaving of wagons, no more coaxing of oxen across mountains or even across the ordinary desert terrain. The problem now was for a man to get out of a country that threatened his life. Fertile lands were to westward; and they must be reached quickly. On foot a man could go quickly through country that his oxen and wagons would never cross. Their one chance was to push on rapidly on foot. On foot they would go; and it would be every man for himself.

The Jayhawkers were in a hurry now. They killed the poorer oxen and dried the meat over the flames of their burning wagons. They would drive the better oxen along as beef on the hoof. They made knapsacks from the wagon canvas. They built canteens from powder horns. They fashioned moccasins from the ox hides. They divided the small store of provisions which remained. Each man was given his share. There would be no more shares. Every man would be on his own.

While the Jayhawkers hurried their preparations for the break westward on foot, the Martin group, the Bennett-Arcane Party and the Reverend Brier and his family came up along the Jayhawker trail to enter Death Valley. The Death Valley Party of '49 was assembling in the valley it named. All the emigrants had met thirst. Provisions were low; and the emigrants were knowing hunger. Not one of the emigrants was desert wise. They were passing through range lands which had supported numbers of Indians for thousands of years. The emigrants walked blindly by food sources and springs. When they stumbled upon water they could scarcely do more than assuage the thirst of the moment, because they had no containers to carry an adequate supply of water into the desert. The oxen were so weak that they could barely keep the wagons

moving on a down grade, yet the emigrants drove them along. The emigrants had all been impatient to get quickly to the gold on the Pacific coast. Now they all wanted to live. They knew that they must quickly escape the dreadful country that confined them. Panic had struck them all. All except the Reverend Brier.

Brier approached the Death Valley region through Forty Mile Cañon. In Forty Mile Cañon Brier burned his wagons. He rested a few days. He drove his oxen ahead of him, packed with the goods he had salvaged from his wagons. Manly discovered the Reverend Brier and his family in Furnace Creek Cañon. It was Christmas Day, 1849. The worn Mrs. Brier and the exhausted children sat forlornly in a volcanic wasteland, listening to the Reverend Brier. The Reverend Brier was delivering an earnest lecture upon the advantages of education.

Manly was the first of the trailing emigrants to overtake the Jayhawkers. Manly came down Furnace Creek Cañon and walked out on the floor of the weird valley. West across Death Valley was Telescope Peak, with the cap of snow that had lured the emigrant train into the trap of Death Valley. The sun burned behind a gray haze and sent shafts of white and gray light upon the brown and black and blue flanks of the sheer Panamints. Yellow hills of borax streamed down from the Funeral Mountains, to melt into the black of lava and the steel of the gigantic fans of gravel. Mountains hemmed the valley in; naked mountains of rock, sharpened and carved by the centuries and painted by the shattered strata of minerals. The wind curled serpents of sand about the salt blocks, over which Manly walked, and in the distance writhing sand devils whirled up against the massive hills. Manly found the trail of the Jayhawkers in the sand and gravel and followed it north in

the valley, until darkness fell and the fires of the Jayhawkers led him to their camp.

A fog of depression hung over the feverishly active camp of the Jayhawkers. The camp was poor. The water was brackish. There was no grass, and only scattered brush for the oxen. The Jayhawkers were almost ready for their effort on foot. Manly said good-by to them and started south to the Bennett-Arcane camp in Furnace Creek. Along the trail, Manly met two of his camp companions, Fish and Gould. They had packs on their backs and were taking their chances on foot. They said good-by. It was the last time Manly saw Fish alive.

Driven by gripping fear, the Bennett-Arcane Party left Furnace Creek and assaulted the walls of the Panamints. They attempted to go south on the salt bed, but the salt bed turned them back. Desperate to find a way through the Panamints, they searched along the valley foot of the range for a pass. They found none. The women and children had only scanty food from the original stocks. The men were living on ox meat alone. Water was an immediate need. Four men who had been driving the Bennett oxen cracked under the maddening pressure of their futile efforts. They would go on foot behind the Jayhawkers. They threw some meat and a few personal belongings into their knapsacks and said good-by. They trudged north after the Jayhawkers.

Another laborious day moved the Bennett-Arcane Party eight miles along the base of the Panamints to a small sulphur well, close to the mouth of a cañon cut into the range at Telescope Peak. They would force their way out through this cañon. Manly went up the cañon ahead of the wagons. He did not get far. He found a dry waterfall over which the wagons could never go. He returned down the cañon and turned the wagons back toward the waterhole in the desert. As the pitiful train

retraced its weary trail, one of Bennett's oxen collapsed. They killed it where it fell. Another ox went down and could not rise. They brought water from the desert well to the exhausted ox and got the animal into camp. Another day had sped without any progress. Another day's food was gone. Another ox was dead. Death for the entire party was one day closer.

The ragged, weary emigrants had been toiling through dry desert lands for weeks. All through September, October, November and December they had labored along the long trail from Salt Lake City, wasting energy on blind and false trails, meeting discouragement with supreme faith, only to end in the trap of Death Valley. They saw nothing of the grandeur of their cruelly beautiful prison. They were wagering life against hunger and thirst. They had known thirst and hunger so long that despair almost displaced their faith and courage. Their oxen stood with galled necks hanging in their yokes, thin and worn, pitifully unequal to their task. All around the emigrants were hundreds of square miles of desert wasteland, without life, apparently without water. The sparse desert mesquite crowning the low aimless hills danced, mockingly, in the shimmer of heat on the desert floor far down below the giant walls of the mountains. There seemed to be no way out.

North of them in the fawn and purple of distance the high mountains of the Panamint and Amargosa Ranges pinched out the valley. To southward along the floor of the interminable valley were miles and miles of salt crust, thrust up in sharp blocks to halt their progress. To west and east the mountains rose abruptly to six, to eleven thousand feet to bar their escape. Nor could they turn back. Food and water were almost gone and they knew the bitterness of the miles that lay behind—the thirst and the heartbreak of the miles that lay behind. If they were to escape, the way was somewhere before them in the

west. Hidden somewhere in the fantastic wall of the Panamint Range there must be a cañon that would let them through to westward. To westward it must be: they had come so far!

Numbed with the fatigue of a day's heavy labors, the emigrants in the Bennett-Arcane Party sat in the black silence of their giant prison to plan their escape. The Jayhawkers had gone on foot. The Martin group had given up their oxen and wagons. Fish and Gould were walking out. Even their own drivers had decided to attempt the escape on foot. At least all of these men on foot were moving forward each day. They were not straining their bodies all day to camp by last night's waterhole. True, these others had no women or children. Women or children could not travel on foot over such difficult country. Mrs. Brier had carried her children into Death Valley. She had crawled part of the way. No, the women and children could not walk out. But the way out could be found on foot, by one man or by two men—two would be better, one might not get through. If either scout got safely to the settlements, he could return with food and some definite road out. There was their new plan. Send two of the youngest and strongest men out as pathfinders. Let them find the way to the coast; fertile California could not be far away. California was probably just across this next range. The party could hold out for fifteen days and the oxen could rest and gain strength. If the scouts were not back in fifteen days . . . The party would hold on as long as it could. It was the one chance of escape.

Lewis Manly and John Rogers were selected to make the desperate effort. They scaled the Panamints through the cañon which had denied the passage of the wagons. From the summit of the Panamints they saw the hot basin of Panamint Valley at their feet, and the black Slate Range and tumbled Argus Mountains beyond, and still further in the endless desert the

high Sierras piled snow up to the sky all along a horizon that was lost in the north. Barren desert spread in all directions, and reared innumerable hills and mountains to thwart them. The scouts looked at the country they must cross. They knew they would not be back in fifteen days. They wondered if they would get through at all.

Crossing Panamint Valley and climbing the Slate Range the scouts met thirst again. Near the summit of the Slate Range they came upon the first traces of the Jayhawkers. The Jayhawkers had dug in the gravel of a cañon for water. Manly and Rogers enlarged the diggings but found no water. Further up the steep cañon they found Fish curled dead beside the trail. How long could a man endure thirst?

Manly and Rogers went on through the days. They munched their meals of dry jerky as they tramped along. They were too nervous with fear to sit down and eat. They seldom spoke, saving their breaths in their dry throats against the efforts of the steep trails. Thirst and the cold broke their rest at night as they slept spoon fashion under a light blanket.

From the summit of the Slate Range they saw a lake glittering in the sun to the southward. They left the Jayhawker trail and turned south to the lake. It was Searles Lake, a red lake, so charged with soda minerals that it was undrinkable. The scouts spat out the bitter liquid and turned dully westward, heading for a cañon to take them through the foothills of the Argus Range.

The ridge of the next hill showed them the cool snow on the distant Sierras. Their tongues and throats were hard and beginning to swell. They were suffering badly for want of water. They would head for the snow on the Sierras. They picked out a butte for a landmark. They walked. Thirst and the cold would not let them sleep. They walked. Moving uncertainly

through the moonlight of an early morning they found a small plate of ice in a shallow rock basin. A short drink and they moved on into the heat of the day among the foothills of the Argus Range, as they entered Indian Wells Valley. They gained on their landmark with exasperating slowness. In the lingering desert dusk they seemed to be less than halfway there. Then as the dusk became black, the orange-red of a camp fire burned in the distance. The scouts walked into a Jayhawker camp. They greeted Doty, the Jayhawker captain, Tom Shannon, L. D. Stephens and several others. They were camped at Indian Wells.

The Jayhawkers were surprised to hear that Manly and Rogers were only four days out of Death Valley. Captain Doty said, "We were four days without water. The boys are panicky. Some of them have gone on ahead. We stopped to kill an ox and we're going to rest a few days and get some water into our systems."

"We saw Fish's body back on the trail."

"Yes. Fish died back on the second range. And Ischam died in the next valley—with the big red lake. He sat down and wouldn't get up. He said he was too tired to go any further. We found some water that afternoon and a couple of the boys went back to him. He was still alive but he couldn't swallow. He died while they were trying to give him a drink. We buried him. We'll probably bury some more before we're out of this damned country!"

The Jayhawkers had left Death Valley just after Manly visited their last camp in the valley. They drove their oxen up the rocky alluvial slope where the road now runs through Townsend Pass. They struggled up Emigrant Wash and found water at Emigrant Springs. They divided their party at the springs. Some went out Emigrant Cañon and others clambered

over the mountains west of the springs. They found a dead ox in the crest belt of the Panamints and came upon a stranger sitting over a feeble fire. Doty said, "There's folks that didn't come in with us scattered all over the hills trying to find a way out, the same as we are. The Briers are somewhere behind us. God knows where!"

Manly and Rogers pushed on from Indian Wells and soon passed the advance party of the Jayhawkers. They were badly off. Hunger and thirst were adding to the ravages of panic. Some of the Jayhawkers were without food and were begging scraps from the others. Powerless to help the suffering Jayhawkers, the scouts went on. The trail down Red Rock Cañon led them out into the plain of the great Mojave Desert that swept away to the west until it faded into the base of the San Gabriel Mountains, which flaunted a lure of snow high above the dry plain. The scouts were still far from the settlements, and moving further from their friends, isolated in Death Valley, hoping for their return.

It was the thought of their friends patiently and confidently enduring the desolate days in Death Valley that helped Manly and Rogers across the stark Mojave. The scouts needed to think of their friends who relied upon them, and they needed the visions of the cool days of well-fed comfort, which would be their reward if they could just walk, walk, walk, across one last desert and one last mountain. Water. Water cool and clear. All a man could drink. Food. All a man could eat. Plenty to drink and plenty to eat. All a man had to do was put his mind on walking. Forget the piece of hot leather that was his tongue. Forget the ache throbbing through his sore body. Forget his burning head and just put his mind on walking. Just walk right up into that snow ahead of him. To-morrow he would roll in that snow. . . . Well, it's further

than it looked. But we'll make it to-day. Or to-morrow, sure. Just keep walking, walking.

Five days out from the Jayhawker camp at Indian Wells, Manly and Rogers stepped into a subdivision of Paradise in a brush choked cañon in the San Gabriel Mountains. They shot a quail, a crow and a hawk and they made a stew and feasted beside a sparkling mountain stream. It was the first sweet water they had known in three months. The next day found them in San Fernando Valley, amidst the green hills, the trees, the streams, and the herds of fattening cattle they had dreamed of. The hospitable people welcomed them, fed them until they were deathly sick, outfitted them and started them back over the hard trail to the rescue of their friends.

The scouts started back to Death Valley well outfitted. In three days in San Fernando Valley they had gathered supplies of dried meat, a sack of small yellow beans, two sacks of unbolted wheat flour, a small sack of wheat, three horses, a mule, packsaddles and some horsehair and rawhide ropes. Their outfit cost them sixty dollars. They headed east, each mounted and leading a pack animal. At a waterhole on the western edge of the Mojave the scouts saw evidence that the Jayhawkers had been there. Manly and Rogers were glad to know that the Jayhawkers had won through. They wondered if the Jayhawkers had sworn as fervently with delight at deliverance as they had cursed with bitterness at thirst and starvation.

Not all of the Jayhawkers had fought through to the Pacific Coast. The men with Doty had remained two days at Indian Wells, where Manly and Rogers left them. The Briers came in out of Searles Basin and joined them. Many of the Jayhawkers were thoroughly dejected, and there was snarling and bickering in camp. Doty, the Jayhawker captain, stilled the quarrels and led the feebler spirits on by the force of his personality and the

example of his own indifference to hardship. Doty brought the Jayhawkers through.

Madness and death were the trail companions of the Jayhawkers across the Mojave. They had the snow on the coast ranges coaxing them toward the last western horizon, the lure of the snow which seemed to retreat before their slow advance. They had very little else to keep them moving. Physically, they were dead men marching with heavy feet through the desert. They hoarded their tiny supply of water and endured the heat of the day without drinking. When they killed an ox they drank the blood. Food was scarce. They cleaned and cooked the intestines and ate them. They singed the hair from the hide and ate the hide. They drank their water in the smallest quantities. But their supply of water shrank and they found no waterhole. Some were without water and the Mojave still ran endlessly ahead, a great dry waste to the mountains and the snow.

Asa Haines sat down in the desert. L. D. Stephens went to Haines. Haines said, "I can't go any further."

"Come," said Stephens. "It isn't far now. Look, you can see the trees up there in the snow."

Haines said, "I can't go any further."

Stephens thought of Fish and Ischam. Both had said they could go no further. Was he to lose his old comrade, Haines, with only a few more days to go? Stephens dug into his knapsack. A little rice. A little tea. A dry crust of bread. Stephens had been saving the precious store against a last weakness. With his last drop of water Stephens made a weak broth for his old comrade. Stephens forced Haines to drink the broth. They rested together. Together the two comrades went on into the sun and miles of the Mojave.

The next night Stephens awoke choking. He crawled to the

Photo by Walter Fiss

A CAÑON GATE INTO THE PANAMINT RANGE. LEGEND SAYS THE JAYHAWERS WENT THROUGH HERE

sleeping Doty and croaked at him, his voice lost in his swelling throat. Doty took his canteen from under his head and gave Stephens half of his water.

The water was gone. The snow still beckoned. Tom Shannon killed an ox. They drank the blood. Those who still had oxen were given pieces of meat. Those without oxen shared the entrails, bones, sinews, hide. They ate them. They softened the horns in fire and gnawed upon them. Shannon gave the liver of the ox to Mrs. Brier. Someone stole it. They were a little mad.

They were approaching the foothills. One of the Jayhawkers thought he saw moisture in the shade of a bush. He dug frantically with his hands and failing to find water buried his face in the sand to suck up the moisture. A Frenchman in the party went mad and walked off into the desert. . . .

They were in the foothills and the trail disappeared. The Jayhawkers fanned out to find it. A gunshot and the smoke of a fire. Water! One of the boys had found water!

Within a few miles of the smoke, Robinson could not take another step. Two men held him on the back of an ox. Robinson protested at so much attention and the two guards relaxed their watch over him. Robinson fell off the ox. "I'm just awfully tired," he said. "Just let me rest. Leave me my blanket and you go ahead to water. I'll come in after I rest."

They left Robinson his blanket. Later, when they went back for him and brought him water he had not stirred. Robinson was dead.

The Mojave was behind the Jayhawkers. They crossed the San Gabriel Mountains into smiling country. Days of rest awaited them and a gradual return to hearty meals. Ahead of them were the forks of a hundred trails to the gold fields. Doty brought his Jayhawkers through to the Pacific.

Manly and Rogers read the signs correctly as they watered their stock at the waterhole on the western edge of the Mojave on their return trek to Death Valley. Doty had brought his Jayhawkers through. The two scouts hoped that in just a few more days the Bennetts and Arcanes would be on their way out of the land of suffering, with two experienced guides to lead them to abundant water and food in an hospitable land, where the gentle hands of kindly people would be stretched forth to help the desert-worn emigrants back to health and strength. Anxious to rejoin their friends in Death Valley, Manly and Rogers went onward across the Mojave, traveling far into the night, until they came to the spring on the desert, west of Red Rock Cañon. There, Manly took the first hours of guard on the stock, only to succumb to the fatigue of a long day and fall asleep as he tried to keep his watch.

In the next few days, Manly and Rogers, driven along by anxiety to rescue the Bennett-Arcane Party, wore themselves out and ignorantly punished the three horses and the little one-eyed mule. The scouts saw too far ahead along the trail. They stretched their planned marches and missed waterholes. They overreached themselves and made unnecessary dry camps. In five days they worked their mounts into the ground. The tough little mule was the only desert-wise member of the rescue party. She left the trail if better footing occurred upon either side and often stopped to crop green foliage on the vegetation along the trail. The horses suffered badly. They trailed with effort, their heads hanging upon down-stretched necks. When the stiff, forced pace and lack of feed and water had weakened the horses, the scouts dismounted and went on foot. But the damage was done. Manly's mare walked head on into a great rock, fell down, and died.

The scouts hoped to get the two remaining horses into the Death Valley camp, and as the horses did not look as though they would survive under packs, the scouts cached most of the provisions in the Argus foothills before they crossed Searles Basin. Then they hurried on. Slow and easy does it in the desert. The scouts did not know.

The little mule carried all the food supplies that had not been hidden among the rocks. The horses went on under saddles alone but they were dying on their feet as the scouts urged them through the loose alluvial soil that tugged at every dragging step. Near the eastern edge of Searles Basin the grave of Ischam was a grim reminder to Manly and Rogers not to make too many dry camps. The scouts hurried over the Slate Range and made a dry camp beyond the body of Fish. The horses did not have so much as a blade of grass.

The scouts hurried their fatigue drunk bodies across the hard clay of Panamint Valley and went slowly, slowly, up a cañon into the Panamint Range. They were at the last barrier between themselves and their friends in Death Valley. As they penetrated deeper into the cañon, the sturdy mule was an inspiration to the scouts. She never gave up her search for water. She never passed a single blade of green foliage. She needed no help over the small dry waterfalls, where the horses made demands upon the overtaxed strength of the scouts. One three-foot wall of rock balked the horses. A small heap of rocks furnished all the assistance the mule needed to scamper up and over the fall, to disappear up the cañon. But the greatest efforts of the scouts could not get the horses over the three-foot obstacle. Night was coming on and water must be found. Thirst was torturing the scouts again. They must find water. Now. Reluctantly the scouts abandoned the horses. Here was

heartbreak. Mrs. Bennett and Mrs. Arcane were to have ridden out to laughing streams of water and green pastures on those horses.

Slowly, the scouts ascended the cañon into the Panamints. Behind them the horses they had left to die neighed despairingly. Miles ahead of the scouts, beyond the range they climbed, the emigrant camp awaited its rescuers. Rescuers! Rescuers who were returning no better off than they had departed. Empty-handed rescuers. Walking. Walking on feet from which sharp rocks had shredded the moccasins, feet so badly cut and bruised that every step was torture. The rescuers might not live to exhibit their failure. Unless they found water they would not live. Their throats and bodies burned with the terrible flame of thirst that soon devours reason. Soon there would be two madmen. Two more bodies in the desert. Slowly, they stumbled drunkenly along. God help them and their poor friends! They wrenched their legs and jarred their miserable bodies with missteps because they could not see the trail. The trail was lost beyond their tears.

Slowly, slowly, the scouts went up the cañon. They overtook the mule. The mule was waiting for them at the base of a sheer rock wall that was twelve feet high. Twelve vertical feet of polished rock. Men have walked off into the desert and laughed themselves to death over less grisly jokes. Manly and Rogers froze with shock. The mule lifted her head from the few blades of grass she had found, looked at the two men, looked up at the smooth face of the high wall, and confidently returned to her grass. And these two worn humans, oppressed with the gloom of their thoughts, afire with thirst, and throbbing with pain, threw off their knapsacks and began to build a rock runway up the high barrier. The mule seemed to expect it of them.

The mule climbed across the dry fall along a ramp that was four inches wide. She never hesitated. And Manly and Rogers emerged from the depths of despair. When they found water in the cañon above the dry fall, their spirits soared. Nothing could stop them now. There was not far to go. If only the people in the Bennett-Arcane camp still waited the return of the scouts, all would be well.

The scouts hurried down the same cañon, up which they had climbed when they started for the settlements, twenty-two days before. As the moment drew near when they should find the emigrant camp, Manly and Rogers were harassed by old doubts and fears. Anything might have happened to their friends. Indians. Sickness. Starvation. Manly stopped on the trail to adjust a moccasin. When he started ahead again he saw Rogers leaning on his rifle, intent upon something on the ground. When Manly approached, Rogers spoke: "Here is Captain Culverwell, dead."

They sighted the wagons. There were only four where they had left seven, and there was no sign of life about the camp. The scouts stalked the camp, sending the mule ahead and watching her for any reaction to danger. Cropping from bush to bush, the mule moved into camp. Nothing stirred. There was only the silence of the valley and thud of their own hearts in their ears. Close to the camp the scouts stifled their breathing and whispered to each other. They held their breaths and leaned forward with every nerve straining as Manly raised his gun. Manly blasted the silence with gunfire.

The silence healed up around them. A moment passed. A man came out from under a wagon and looked about him and a great shout went up: "The boys!" he cried. "The boys have come! The boys have come!" Other people appeared magically about the wagons. Mr. and Mrs. Bennett and the Arcanes.

Their friends rushed to the scouts who stood limp with reaction, unable to speak or move. No one spoke. They were all beyond speech. Embraces and tears replaced the words which would not come through throats choked with emotion. Mrs. Bennett clung moaning to Manly's knees. Her husband was the first to speak. He did not say what he wanted to say. He said, "I know you have found some place because you have a mule."

Not all of the Bennett-Arcane Party had been able to endure the strain of inactive waiting. Some had preferred death to come to them while they were moving. They had left the camp in groups as the weeks went by and the scouts did not return. They all found death in movement.

Looking at little Martha Bennett, the scouts could understand why Mrs. Bennett had fallen on her knees before them and clasped them in her arms with wild hysteria. Little Martha Bennett had almost died. Little Martha Bennett was still dying, her tiny body grotesquely bloated by starvation and her face an elfish mask of gray skin drawn tight across the bones. Manly and Rogers could understand the praise and blessings that were heaped upon them. They had returned none too soon.

The remnant of the Bennett-Arcane Party had despaired of the scouts' return and had begun preparations to leave the valley on foot. Manly and Rogers sped the packing to a conclusion. All the provisions of the camp went into the packs on the gallant mule. Other equipment was limited to the barest necessities. They took the clothing they wore, a tin cup and an improvised canteen for each person, and a camp kettle and a few knives and spoons. The women sewed the tails of two hickory shirts together and the shirts were thrown across the back of an ox, so that the two smaller children could ride, each

Photo by courtesy Union Pacific System

DEATH VALLEY AND THE PANAMINT RANGE FROM FURNACE CREEK WASH. A FLUME RUNS FROM THE LEFT FOREGROUND TO FURNACE CREEK RANCH

standing up in a shirt. Bedding and blankets, and light cloth shelters made from the wagon covers were packed on the spare oxen.

When Mrs. Arcane learned that she could take no clothes except those she could wear, she ransacked her finery and selected her best dresses. She rescued her best hat and added a long ribbon to its furbelows. She arrayed herself and dressed her son, Charley, in his best suit. The Bennett-Arcane Party was ready to leave the oppressive prison of Death Valley.

The odd pack train of the emigrants faced along the trail toward the promised valleys of the Pacific and moved off through the shimmering gray light toward the towers of the Panamints. John Rogers headed the train, leading the little mule. Behind him were the oxen, nervous under unaccustomed burdens. Mrs. Bennett and Mrs. Arcane, in her voluminous finery, each rode an ox. Along the line of pack animals, Asabel Bennett and Manly adjusted the packs and kept the oxen moving. Last in the procession was Mr. Arcane, who guided the ox that carried the four children, the younger two standing in the pockets made from the shirts, and the older two, George and Melissa Bennett, riding the back of the ox.

The pack train had progressed about four miles when a pack slipped off one of the leading oxen. The ox bucked and reared and became thoroughly entangled in the pack straps. The terrified animal bawled its terror to the other oxen and stampeded the entire train. Every pack animal ran wild until it shed its pack. Mrs. Bennett and Mr. Arcane rescued the children. But no one rescued Mrs. Arcane. Her ox took panic with the rest and was hightailing around in the sand, with the gayly dressed Mrs. Arcane, her best hat at a rakish angle over her eyes, sticking tight to the back of the frenzied beast. Her exhibition of trick riding lasted long enough to convulse her

companions with laughter. When Mrs. Arcane, with her great skirts and many ribbons, parted from the ox at the top of one of its crow hops and landed in a rumpled heap in the sand no one went to help her. The emigrants were too weak to help her. They were strangers to laughter. Mrs. Arcane was unhurt but she had scant words for those she had amused. The emigrants would need that laugh in the weeks to come.

There was time lost in reassembling the scattered oxen and readjusting the packs. The pack train fell far short of its intended camp. Hurrying on the next day the emigrants made the long grind up the Panamints. The women made no attempt to ride the oxen. The children suffered as they were jolted over the rough ground in the narrow pack pockets and slammed against the bony sides of the ox. The complaints of the children hurt every one else. Worn with a day of climbing, the women stretched themselves on blankets. They were exhausted and discouraged. The prospect of another day, and a succession of other days of walking through the distance, frightened them. The return of Manly and Rogers had not effected their rescue. It was not as simple as that. The survivors of this party would walk to safety on their own legs. There was nothing to do but go on and on.

The Bennett-Arcane Party had its last view of Death Valley on the second morning of its tramp to the coast. Standing on the crest of the Panamint Range where they could look down into the valley's sink and across the valley's depths to the massive buttresses of the Funeral and Black Mountains, the emigrants thought of the sufferings and privations they had already withstood and the hardships they were yet to endure. They thought of the maddening weeks of waiting in the prison of the valley, their food dwindling, their children sickening and starving before their eyes. They thought

of the friends who had said good-by and wandered off to die. Standing there on the Panamints, the emigrants named Death Valley. Some one said, "Good-by, Death Valley."

No single member of the Bennett-Arcane Party was in fit physical condition to meet the rigors of the trail along the last leg of the long journey to the Pacific coast. All the emigrants were reduced by weeks of striving along harsh trails toward a chimerical goal. To their handicap of impoverished strength there had been added weeks of nerve-trying anxiety, weeks of idle sitting in a vast, crushing silence, when nothing seemed certain but the slow approach of death. They were moving forward now, but they moved in apathy and desperation. If they had confidence in themselves when they started their march to freedom they lost it when they faced west on the Panamint summit and saw the brutal country across which they must walk. Looking at the cruel lands before them, the emigrants scarcely believed they would survive.

The distress of the women increased with every hour on the harsh trails through the blinding valleys and over the steep ranges. At the end of each day of tramping, Mrs. Bennett and Mrs. Arcane collapsed into a shallow pile of blankets, which one of the men always went ahead to prepare for them. Huddled there on the blankets, attempting to revive enough spirit to comfort the suffering children, the forlorn women filled the men with pity. As the strength and spirit of the women sank before the stern demands of to-morrow's trails, a constant question was on their lips.

"How far is it now?" they asked. "Are we halfway yet? Oh, I cannot go on much longer."

But they did go on. They went on for nine days; forward on foot over trails that tore the clothes from scrawny bodies and cut the shoes from raw and blistered feet. After nine days that

wrenched the hearts from every one the scouts told the women that they were halfway to the settlements. Halfway.

They were at Red Rock Cañon. The Mojave which had demanded a last toll of lives from the Jayhawkers still lay between them and the California they sought. Manly and Rogers had retrieved the cache of food and that supply of grain was almost gone. The beans and flour were all gone. Only a little wheat remained. One of the weakened oxen was being slain every few days. Little Charley Arcane cried day and night from the burning of a violent skin eruption. Martha Bennett was still swollen by starvation. Men and women were lame and weak and sore. But there was nothing they could do. So they sat on the edge of the Mojave Desert and talked of the clear, babbling stream where Manly and Rogers had feasted on quail and hawk and crow. They were halfway there.

A Mojave storm gathered over them that night. The storm swooped down and flicked away the sad shelters of light cloth they hastily erected. The storm laid down a blanket of snow and left the emigrants to spend the night groveling together in the sand for warmth. Still drenched and shivering they met the day. Walking barefoot in the snow they heated blankets at a fire and threw them over those who still huddled together in the sand. Manly shot an ox. Blood pudding with salt, and roast ox meat for breakfast. They dried the meat. They made moccasins for the barefoot. They fixed their packs and moved onward into the Mojave.

"Be patient, Mr. Arcane," said Manly. "Rogers and I know just how many camps there are between us and the settlements. We'll tell you just when we are getting there. We won't fool you or surprise you in any way."

"Well," said Arcane. "I was almost in hopes you would. I like to be disappointed that way."

Rogers asked, "What do you suppose people will say when we tell them that our oxen were so poor that this little mule packed the meat of a whole ox? And that there was no marrow in the great thigh bones?"

"I don't give a damn what they say," said Arcane. "If I ever get a chance to tell anyone what we've gone through they can call me a liar and I won't fight them."

There were many halts on the Mojave made to rest the women or to try to comfort the children. Charley Arcane was suffering intensely from the rash on his skin, which was greatly aggravated by constant travel. Mr. Arcane carried his son in his arms as far as his waning strength permitted. The wretched group marched into the Mojave to a dry camp. The San Gabriel Mountains sat on the far western horizon.

Another footsore day and they found water in a natural clay tank. The water was so alkaline that it was wet only on one side. The oxen scented the water at a long distance and came up to it at an accelerated pace. The scouts fought the animals off until the straggling families came up and got water. They camped. The San Gabriels were much closer. There was little rest in the camp. All were torn with impatience to reach the mountains. Charley Arcane was screaming with the burning torment of his rash. There was nothing to do but hurry on to the salvation beyond the mountains. They would be in the foothills the next day.

But the next day they made only a few miles. They came to a wide stretch of fine clay still wet from the storm that had made them miserable with snow and furnished them with water in the natural desert tank. Manly and Rogers went barefoot through the gumbo to avoid the heavy pull on their moccasins, but the feet of the others would not carry them across the broken ground. The dragging grip of the wet clay was too much for

the feeble, mile-weary legs of the women. A dry camp was forced upon those who had anticipated a camp in the foothills with water.

A night of broken rest revived hopes strong enough to survive another waterless breakfast of dried meat. The emigrants walked ahead. They reached the foothills and found standing water before sundown. They were at the last barrier. Beyond this mountain was California. They could climb up this mountain and look down into green, fertile lands. There would be no more horizons of volcanic mountains and fantastic chemical valleys. Beyond this range there was water; water and food and shelter; people and their homes. This was the last range.

Two feet of snow among the junipers halted them on the desert side of the mountain. The oxen could not get through the soft snow. They camped overnight waiting for the snow to freeze. Manly killed one of the six remaining oxen. No need to be niggardly now. They were close to food in plenty. It was a cold camp, but no one complained. To-morrow!

Before daylight they were moving across the summit on the hard snow crust. They descended through the slashing brush of the cañons and came at last to the brook they were seeking. Their lives were given back to them at that mountain stream.

They had reached California. They had come through seventeen hundred miles of backbreaking toil, through hardship and sorrow, through weeks and months of weakness and fear. They had escaped Death Valley. Walking down the green slopes of the San Fernando Valley toward the generous hospitality of the ranchos, the emigrants talked of their good fortune. They wondered how they had conquered the hellish trails behind them. And they wondered about the trails ahead. They were all emaciated scarecrows. The rags of the women did not

Photo © by Walter Fiss

GRAPEVINE MOUNTAINS FROM THE SAND DUNES

cover their knees. There was not one dollar Mex in the entire group. They were all weak and dull. But they could still discuss trails. They had come seventeen hundred miles on foot to the gold fields of California. What was the best route to the gold fields from here?

MINES AND MINERS

Jake is one of Death Valley's prospectors. Years ago he cut a fuse too short and a stick of dynamite took his left arm off at the elbow. But Jake is no cripple. A year or so ago Jake drove his car across the valley near the head of the rush of people bound east for the gold strike over in Wahmonie, Nevada. A week later we were surprised to see Jake come back. There was still a lot of excitement about the strike at Wahmonie. A tent city was springing up and there was promise of a permanent camp. Jake had looked at Wahmonie and now he was headed the other way. He stopped his car at the gas station at the end of the toll road.

Some one asked, "How's things at Wahmonie, Jake? Pretty lively?"

"Lively? Yeah. It's lively." Jake had a far-away look in his eye as though he saw the roaring early days of Tonopah and Goldfield. Jake knew what a boom camp should be.

"Couldn't you get a claim, Jake? Ain't there no claims left?"

"Yeah. They's claims. Lotsa claims."

"Well, what are you doen back so soon? Ain't she a good town?"

"Good town! Hell, they ain't no good towns any more. Do you know what they're doen in Wahmomie? They's fellows sellen kewpie dolls on the streets! Kewpie dolls! . . . Keyryst! Gimme five gallons a gas."

CHAPTER FIVE

MINES AND MINERS

THE Death Valley Party of 1849 trekked westward across the desert before the days of the news service syndicates. None of the survivors of the emigrant party wrote exclusive stories about their own heroism and the unsportsmanlike conduct and actual fear of the rest of the emigrants. But the story got around just the same. The restless men of that generation met each other along the western trails and talked about good routes and bad routes, and good feed and bad water, and how dumb some of the emigrants were to be traipsing around the desert country with such broken-down outfits. The grim tale of the Death Valley Party spread along the trails and the word went around that the deep narrow valley between the Panamint and Amargosa Ranges was to be avoided. Anyone with good sense would stay away from the thirst and heat and poison in Death Valley.

Men listened to others describe the terrors of the valley, and as the reputation of Death Valley became more and more evil the footloose adventurers warned each other emphatically that Death Valley was to be shunned. Men heard the convincing tales and dire warnings and were satisfied that Death Valley must be an awful place. So quite a few of them took up the nearest trail to Death Valley.

The emigrants who formed the Death Valley Party of 1849 left more than all their possessions in Death Valley, left some-

thing more precious than the lives of their dearest friends. They lost a mine in Death Valley. The Gunsight Mine. One of the emigrants was coming down the west side of the Panamint Range when he noticed that the front sight was missing from his gun. He recollected that a few miles back along the trail he had struck his gun against a boulder. He remembered that boulder and he hurried back to it. He found his sight on the ground close to the boulder, just where he expected to find it, and as he picked up the gun sight he saw rich silver ore lying on the ground. He examined the ore and was impressed by its high value. Before he saw the ore he had thought of nothing but escape from the desert. He had been saving his strength by following the washes and cuts through the hills, staying on the most natural trail through the low places. But when he found the ore he forgot thirst and weariness and began to climb hills.

The emigrant knew that the ore he had picked up was only a bit of float washed down from the main ore body somewhere in the hills above him. He traced the float up the wash and searched the rock strata until he discovered the main lead. The quantity of rich ore in sight astonished him. He was glad he had thrown away everything he owned in his effort to escape. He was traveling light and was able to fill his pockets with ore specimens. The specimens got heavy before he reached Los Angeles and he threw them away. But he was still astonished by the richness of the mine he had stumbled upon. He described the mine to every one and explained that he had named it the Gunsight Mine after the lost front sight which led him to its discovery.

Since 1850 many men have wished that the emigrant had been a little more careful of his damn front sight, or that he had never gone back to look for it. The Gunsight Mine has been

Photo by courtesy Union Pacific System

RYAN, CALIFORNIA. BORAX HEADQUARTERS ON THE EASTERN EDGE OF DEATH VALLEY

the Lost Gunsight Mine since 1850, when the emigrant reached the Pacific coast with the story of his strike.

Expeditions began the search for the Lost Gunsight Mine in the fifties. Dr. Darwin French led fifteen men into the Death Valley region looking for the mine in 1860. They did not find the mine but they named the town of Darwin, some thirty miles west of the Panamint Range. Fifteen years later a very rich body of lead-silver ore was discovered at Darwin, and Darwin is still a mining town. Other lead-silver strikes have been made in the Panamints, but the Lost Gunsight Mine is still lost.

Other tales the Death Valley emigrants told of the valley's wild form and structure sent survey parties into the valley to examine its chemical and mineral resources or to map its boundaries. Less reputable expeditions also entered Death Valley. All through the West, whooping mining towns were writing their vivid histories. Road agents were on the prowl. Bad men picked their night to howl and howled it through unless some one stopped their song with lead. But there were limits to the patience of the toughest camps. Many of the miners were interested in the mines. Staying up all night, every night, interfered with getting the ore out. The bad men were invited to go other places and be bad. Sheriffs became numerous and businesslike. The bad men sought refuge in the bad lands. Some of them went to Death Valley.

In 1872 one group of outlaws made the Panamint Range just one jump ahead of the agents of the Wells Fargo Company. They found rich ore and helped establish the town of Panamint high up in the mountain just west of its crest. The ore was so promising that the bandits decided to reform and be honest men.

The details of Panamint's history have been preserved by

that assiduous student of early California days, Mr. W. A. Chalfant, in his "Story of Inyo," now unfortunately out of print. Mr. Chalfant is the son of Pleasant Arthur Chalfant, a Forty-niner who made a portion of the desert trek with the Death Valley Party of 1849.

As news of the strike at Panamint trickled across the waste-land barrier, between the new town and the west coast, the miners came into Panamint. Panamint was a woolly town of sudden death, worthy of its founders. The steep mountain slopes confined the townsite to the bottom of a narrow cañon. A branch cañon became the cemetery in which those who finished second on the draw were planted. The graveyard grew with the population. The graveyard was the only permanent thing about the camp.

In the first three months of Panamint's existence over one hundred claims were staked out. The ore was a rich, silver chloride and copper-silver glance which assayed values up to four thousand dollars a ton. In an effort to raise funds for development work, a half a ton of ore was shipped out by pack train and put on display in a Los Angeles barroom. The publicity which rewarded the dazzling display interested sufficient capital to form the Panamint Mining Company, which issued two million dollars in stock. Senators Jones and Stewart, who were largely responsible for the formation of the company, paid over three hundred thousand dollars for a group of claims. The sale of claims was interrupted by the Wells Fargo Company. The express company declared that some of the honest miners who were selling their claims had plundered express shipments before they became citizens of Panamint. The express company suggested that the miners either reimburse the company for their earlier pranks or go to jail. The miners made a cash settlement of twelve thousand dollars, obtained receipts

from the express company, which established them as honest men, and the sale of claims went on.

Within a year after the discovery of ore in Panamint the number of claims located had increased to five hundred. More than a thousand people were living in Panamint and quite a few had been buried. The *Panamint News* began publication in November, 1874, eighteen months after the original strike. Transportation was Panamint's gravest problem. Only a few wagons succeeded in getting down into Panamint Valley and up the steep cañon into Panamint. Mules and burros packed supplies in and ore out. The miners burned a lot of powder blasting out the trail to form a road, but the grades were too severe for heavy freighting, and pack trains continued to be the main means of transportation.

As Panamint grew, civic pride overcame the difficulties of getting lumber and building materials over the steep trails, and frame and stone buildings arose to replace the tents which had been such unsatisfactory barrooms. Panamint soon had a reputation as a nice wild town, in which a lone wolf could howl and find plenty of volunteers to help him out in the chorus. Playboys who were finding other towns too small for their activities were attracted by the possibilities of Panamint. The fifteen hundred Panamint citizens spent many joyous evenings opening new saloons. The war dance began any time after two in the morning and the first killing usually only slowed up the party long enough for a verdict of self-defense to be rendered. The funerals were held later in the day.

Panamint lasted not quite four years. Many mining companies were formed. Stocks and claims were traded and sold. The gamblers ran no-limit games and the bars were never closed. Millions were spent in the mines. The ore body was rich. Some of it was so rich that it was shipped to England to

be worked and still returned a profit. But most of the ore was in combinations defying economical recovery. Senators Jones and Stewart took a loss estimated at two million dollars before they were convinced that there was no money to be made in Panamint. The last mine shut down in 1877. Panamint, Death Valley's first boom camp, is a dot on the map. It is a hard grind in an automobile up the narrow cañon to the ruins and bottles of the town that was bad.

Darwin followed Panamint as a boom town. Darwin was never the rooten, tooten town that Panamint was. Darwin was closer to the law. Darwin is west of the Argus Range and is beyond the true Death Valley region, but it is the nearest town on the west of the valley. Prospectors outfit and play poker in Darwin and tourists, driving in to Lost Valley at the northern end of Death Valley, pass through Darwin.

Silver-lead ores were discovered close to Darwin in the early seventies. In 1875 a pipe line was built to the Coso Mountains and water brought into town. Between 1875 and 1877 three smelters were built and for a few years there was heavy production at the mines. In the late seventies the decline of Panamint helped to swell the population of Darwin to several thousand. The richer, more easily mined ores were early exhausted and the expenses of freighting all supplies across the two hundred and seventy-five miles of desert, between Los Angeles and Darwin, became too great a charge upon the low-grade ores. Production ended. It was the same problem of difficult transportation and high freight rates that had isolated Panamint as soon as the accessible high-grade ore was gone. Panamint was forty miles further east over country that was straight up and down, but Panamint had vastly richer ores to pay the freight. When Panamint died it was permanently dead. Darwin has never died entirely.

Darwin lapsed into stagnation in the early eighties, but has awakened to several impassioned periods of mining activity. The Darwin mines have produced about three and one-half million dollars and there is a lot of ore in the Darwin Hills. The mines ship when the metal market is up. The railroad has not reached Darwin but it came in as far as Keeler in 1883. Darwin got a telephone in 1913. The roads are getting better every year. Darwin is waiting for the next boom.

Death Valley itself had permanent residents at Furnace Creek while Panamint was booming loudly up behind the valley's western wall of rock. Several hundred Paiute Indians were living in the hills and minding their own business. There were also other inhabitants; bad Indians, horse thieves, and hard-faced men with nervous trigger fingers. Mr. W. A. Chalfant, the historian of Inyo County, says that a firm-voiced gentleman named Belleren Tech established the Furnace Creek Ranch in 1870 and raised alfalfa, barley and quail. Mr. Tech had raised too much hell in general in other localities and craved solitude. Tech took on a Mormon named Jackson as his partner, trading an interest in the ranch for Jackson's yoke of oxen. Tech tired of Jackson before a week was out and ran Jackson out of the valley with a shotgun. This dissolution of the partnership left Belleren Tech his ranch and his solitude, plus a yoke of oxen.

From the time of Tech up until very recent years Furnace Creek was the rendezvous for miners, adventurers, teamsters, scientists, and outlaws, whose business or lack of it brought them to Death Valley. The ranch was close to the old Indian trails that traversed the valley. The Indians had camped at Furnace Creek for centuries. They had taken health baths there. The white travelers through Death Valley followed the old Indian trails and frequently stopped over at the ranch at

Furnace Creek. Some of them adopted the old Indian custom of taking a bath for their health. Taking the baths at Furnace Creek became quite the popular thing. Prospectors came out of the hills to visit and rest at the ranch. There was some one to talk to at Furnace Creek.

In 1880 borax was discovered in Death Valley. The borax deposits of the United States are limited to California, Nevada and Oregon. Borax was first obtained in the states by evaporating the waters of Clear Lake, eighty miles north of San Francisco. Clear Lake produced borax in commercial quantities in 1864. In the seventies, borax was discovered in great quantities on many of the alkaline marshes of western Nevada and eastern California. Chalfant relates that the Death Valley deposits were discovered by Aaron Winters and his wife, Rosie. The Winters were living in abject poverty on Ash Meadows to the east of the Funeral Mountains. They entertained a prospector overnight, sharing their hovel and their pine nuts with the visitor, and listened to his stories of the fortunes being made in borax. The prospector's description of the Nevada borax beds stirred Winters' memory. Winters thought he had seen similar deposits. From the prospector Winters learned how to test for borax in the field and how to market borax when it was found. Winters doubted that his luck was good enough to lead him to borax, but he went into Death Valley and tested the marsh deposit which fitted the description of the prospector. Winters sold his find to W. T. Coleman and F. M. Smith for twenty thousand dollars.

The Eagle Borax Works in the southern part of Death Valley, and the Old Harmony Borax Works north of Furnace Creek, were soon in operation. The borax crust of the valley marsh was refined by an evaporative process and hauled over one hundred and fifty miles of scorching desert to the railhead.

Photo © by Stephen H. Willard

RHYOLITE AND THE BULLFROG HILLS

F. M. Smith became Borax Smith, the Borax King, and made the twenty-mule team famous. There was an excellent market for borax when the valley plants began operation in the eighties. Fortunes were made recovering borax from the marshes, because prices were high enough to pay the freight of long hauls and return a profit over the expensive methods of recovery. Borax plants began to flourish beside all the large marshes on the ancient lake beds throughout Nevada and California. By 1885 the production of native borax had reached a tremendous tonnage. Large quantities of borax, imported from Italy, were thrown into the same market. The price of borax went down. The Death Valley plants were abandoned in 1887.

Men interested in the borax industry had long believed that the borax deposits of the marshes were secondary deposits which had been washed down from larger deposits of borax in the hills above the marshes. Search was made for these main deposits and in 1890 bedded deposits of borate of lime were found in the Tertiary Lake sediments in the structure of the mountains, close to the marshes which had been exploited. This discovery of colemanite revolutionized the industry. The bedded deposits were more extensive than the marsh crusts, were much more accessible and would yield a purer product at a reduced cost. Large deposits of colemanite were found at Furnace Creek in the old lake beds at Ryan. The Ryan mines have been shut down since 1927. Tourists ride through the Death Valley borax mine in the cars of the narrow gauge railroad and lug home samples of borax.

In the early eighties, prospectors looking for mines, and adventurers looking for some place to hole up, began to enter Death Valley in increasing numbers. The borax plants were operating and some scientist who had visited the valley had spoken of it as the drugstore of the world. The white wanderers

of the desert places had a number of camps and outposts along the trails into Death Valley. Owens Valley, along the base of the Sierra Nevada Range, eighty miles west of Death Valley, was well settled, and Darwin was a town only forty-five miles from the valley on the west. The rise of borax works at Searles Lake—the red lake of the emigrants—at Borate, close to Barstow, and at Resting Springs on the south spur of the Black Mountains, established a line of camps along the main routes into Death Valley. Travel into the valley was still difficult and dangerous, but the trails and waterholes were becoming better known and the desert men were learning to stay on the trails as they went into the wastelands.

The mining records of the valley district show many claims registered from 1880 onward. Prospectors were crawling through the naked country, looking for treasure. And they were finding it. They found rich silver and gold ore. Their finds were often in stringers and pockets and all of them were a long way from nowhere. There were no roads and capital remembered the millions sunk in Panamint. As it takes money to prove the depth of an ore body, the prospectors sat down on their discoveries to wait. They established rude ranches along the Amargosa River in Oasis Valley, to the east of Death Valley. They built cabins in the brief watered areas of the Death Valley region. They did a little work on their claims and those who had high-grade, packed enough out to promote grubstakes and keep themselves in bacon and beans. They cursed the country but they stayed. They liked it.

The lightning struck close to Death Valley in 1900 when gold was found at Tonopah, Nevada. The magic of Tonopah's ore electrified the whole desert. They had always known it was there. The rush was on. Al Meyers found Goldfield in 1903. Bigger and richer than Tonopah. You never saw such

a gold mine. The railroads coming in to Tonapah and Goldfield would open up the whole mining district. The Death Valley mines would be worked now. The miners extended their holdings. Newcomers drifted into Death Valley, combing the country. In 1903 Domingo Atchasin and Jack Keane staked the Keane Wonder Mine at the Death Valley base of the Funeral Mountians, close to Boundary Cañon. In the same year lead-silver was found in Chloride Cliff, three thousand feet above the Keane Wonder. The strikes came in fast and the Death Valley region began to pulse with life. Men who had prospected the god-forsaken hills in the eighties and nineties remembered the likely looking ledges they had abandoned because they were too far out of the world. These earlier prospectors came back to keep their properties alive. They had mines for sale. They sold them when Shorty Harris made his strike at Bullfrog in 1904.

Bullfrog lies in the Bullfrog Hills a few miles from Beatty, Nevada. Bullfrog and Rhyolite are one. They are twenty-five miles east from Death Valley, across the Amargosa Range and the Amargosa Desert. Shorty Harris sold his Bullfrog strike for four hundred dollars. He got a little better price than the Indians did for Manhattan Island.

I was talking to Bill Corcoran about Bullfrog and Rhyolite. Bill said, "The original strike at Bullfrog was made in awful pretty rock. It was green and blue and had gold in hunks all through it. Awful pretty. It was jewelry rock and it polished up so nice that a lot of it was made into jewelry. They could get more for it that way than they could for the gold that was in it. You still see some of that Bullfrog jewelry around.

"When they found that jewelry rock they loaded a wagon with it at Bullfrog and started for Goldfield and Tonopah. They showed what they'd found to everybody they met. They

didn't meet many because there was nothen at Bullfrog then, and hardly any travel along the desert where the road runs now. They didn't have to show that ore to many people for the news to get around. You don't have to tell news like that to anyone. It just travels all by itself. It sure does. When they got that load of gold to Goldfield, everybody in Goldfield was in Bullfrog, and along between Goldfield and Tonopah they met everybody that lived in Tonopah comen down the trail headen for Bullfrog. I was one of the first to get there.

"Those were great days in Bullfrog, with every one pilen in. It didn't take Bullfrog long to grow. Seemed like the whole world was comen in, and there was seven thousand people there on the raw desert in no time at all. Only a few of us had tents.

"I remember a fellar drove down from Goldfield with the first wagon-load of whisky. He got within a few miles of where he was goen, and they made him stop. He got off his wagon and set up a bar on two kegs of whisky. He never did get to Bullfrog that trip. That was a wild time; sort of a christnen for Bullfrog. Drinks was supposed to be four bits, but the bartender kept whatever money you gave him. That bartender didn't have time to make any change. He was busy. He just kept what money he got, and if you didn't have any money you drank anyway, so I guess it all come out pretty even.

"My, but they did get awful drunk around that wagon! They got so drunk they began to want somethen more fancy to drink. Straight licker didn't please them. So they come up to my place. They'd heard I had a case of eggs. I did, too. I'd got them over in Beatty. I happened to be standen there when this case of eggs come in, and I said, 'Those are my eggs,' and I bought them. I took them over to Bullfrog, figuren I'd have me some eggs. But these highgraders had to come up to my place all

drunk and demanden my eggs so they could have some fancy mixed drinks.

"They took my eggs down to the wagon and we had some mixed drinks. I never saw such mixed drinks. They got a couple of buckets and everybody helped mix the drinks. One fellar would have a bottle of gin, and another a bottle of whisky. Some even had bottles of beer. And they was all pouren their bottles into the buckets, helpen in the mixen. Other fellars was cracken up my eggs. They was helpen, too. Everything was mixed up and you grabbed a dipper and when you got a chance you stuck it in one of the buckets and drank whisky, and gin, and beer, and eggs—all mixed up. Even the eggshells. You drank them, too. My God! It was awful!

"Hell, no, they never paid me for my eggs. That's why I had to help drink their fancy mixed drinks. Afterwards I wished I had my eggs back. You know food was scarce. Awful scarce. There was thousands of people and lots of gold and money, but we didn't have anything to eat. It was serious for a while. Your money just wasn't any good. You couldn't eat it.

"Old Sam Adams got a couple of chickens some place. You know Old Sam. He's up on Harrisburg Flats now. Well, Sam was cooken these two chickens one night when a wind storm come up. Sam come holleren down from his tent for some of us to come up and hold up his tent and help him stake it down better, because he was afraid it would blow down on his cook-stove and burn up his outfit. About eighteen of us went up to Sam's place to help him. Sam had his chickens in a five-gallon can stewen on top of the stove inside the tent, and while we was all millen around helpen Sam fix his tent up, somebody lifted the lid off the five-gallon can and got off with Sam's two chickens. He put the lid back on real careful.

"Well, old Sam is a methodical sort of a cuss, and after we fixed his tent and went away, Sam sat there in his tent for a couple of hours, stuffen wood into that stove under that five-gallon can of water and thinken about the nice mess of chicken he was goen to have. When Sam finally lifted the lid to see how his chickens was comen and saw all that water boilen away in the can, he let out a bellar you could hear all the way to Goldfield and come whoopen down off the hill with a big knife. My God, but Sam was mad! I never saw a man so mad. He was all ready to kill somebody. 'Course by that time his chickens was completely gone and Sam never did find out who got them."

Bullfrog soon became a permanent camp. The settlement of tents was first called Amargosa City and was located close to the original discovery. Later discoveries at Bonanza and Ladd Mountains caused Amargosa City to move east to the settlements of Bonanza, Bullfrog and Beatty. In 1905 a town-site company with high pressure salesmen laid out Rhyolite, between Bonanza and Ladd Mountains, offered free business lots and convinced the miners that it was unhealthy to be living down in the hollow at Bullfrog. The residents of Bullfrog moved half a mile away and fifty feet higher up the hill into Rhyolite.

Up until the later part of 1906 the transportation facilities of the Bullfrog Mining District were practicable only for the richest ore. The owners of claims did nothing beyond some development work on their mines and occupied themselves buying and selling claims. Cash was plentiful and credit was good. The wires and telephone lines stretched across the desert into Rhyolite. An exchange was set up. The deluge of stock issues which was to inundate Rhyolite began.

Just east of Rhyolite on the slope of Ladd Mountain were

the prospect holes of the Bullfrog Mining Company, and a little higher up the slope the claims of the National Bank Mine. Shorty Harris, who had discovered the Bullfrog district in his original strike on Bullfrog Mountain, three miles to the west, shared the ownership of the Bullfrog Mining Company with Ed Cross and Billy Fray. Bill Corcoran found the National Bank Mine and had Walter Smith, L. L. Patrick and Sol Camp as his partners. The National Bank was a good prospect. Some of its ore ran two hundred and thirty dollars in gold. The entire group of claims of these two companies was almost right in town. Rhyolite's line with its honkey-tonks ran along in the hollow at the foot of Ladd Mountain. You could stand on the dumps of the National Bank Mine and toss rocks down on the roofs of the cribs.

These claims of the Bullfrog Mining Company and the National Bank Mine were something more than mere gold claims. They were the solution of one of Death Valley's mysteries. When Bill Corcoran found the National Bank he found a mine men had been looking for since the end of the Civil War. Bill found the Lost Breyfogle Mine.

During the Civil War many southerners who had located in Nevada returned to their homes in the south to join the fighting forces of the Confederacy. Jacob Breyfogle was a desert man. He was engaged by one party of Southerners to guide the party from Austin, Nevada, south across the desert to Yuma, Arizona. Breyfogle left Austin with the Southerners and the next Austin heard of him he was brought into town more dead than alive. He had been found delirious at Stonewall Springs. His body was a mass of deep cuts and great bruised welts and he had been severely beaten about the head. He had been found with a number of specimens of very rich gold quartz in his possession. The Breyfogle mystery. Who had beaten Brey-

fogle, and why? What was more important, where did the rich ore come from?

Breyfogle was tenderly cared for. He regained his bodily vigor but his mind was shaken and his memory gone. The ore he brought in was very rich. Men tried to trace Breyfogle's movements from the time he left Austin until he was found at Stonewall Springs. Somewhere along that trail there was a rich, unstaked gold mine.

Breyfogle took the Southerners from Austin to Yuma and started back for Austin alone. He remembered reaching Daylight Spring in Boundary Cañon, which divides the Grapevine and Funeral Mountains of the Amargosa Range. He had found his mine before he reached the spring. He did not know where. He thought he could see the mine from Daylight Spring. He remembered being terribly beaten by Indians who left him for dead and stole all his outfit, except one horse. He remembered getting on that horse and starting north. That was all. Nothing very definite to guide those who were looking for a mine. But it was enough to send any number of expeditions out into the desert after the Lost Breyfogle Mine. Breyfogle got grubstake after grubstake and headed several searches for the dirty-brown quartz that held so much gold.

Bill Corcoran was not looking for the Lost Breyfogle Mine when he located it. Carl Stoddard convinced Bill long afterward that he had found the Lost Breyfogle. Carl's father had known Jacob Breyfogle and Breyfogle had always insisted that he could see his mine from Daylight Spring. Bill went up to Daylight Spring and looked northeast through the notch in the pass, and there across the Amargosa Desert were the claims of the Bullfrog Mining Company and the National Bank Mine, streaks of dirty-brown quartz across the face of Ladd Mountain.

Not all of the desert men agree with Bill Corcoran and Carl

Photo by Walter Fiss

DEATH VALLEY'S FIRST TRACTOR IN DAYLIGHT PASS

Stoddard. The mines men find are never as rich as those they lose.

Bill Corcoran did not hold the National Bank Mine very long. He was nineteen years old when he sold his interest for forty thousand dollars. Cash. Bill wishes he had been older.

The Montgomery-Shoshone Mine was the big mine of Rhyolite. It was discovered by Ben Edwards. At one period of its development a one-tenth interest brought one hundred thousand dollars. The mine was finally purchased by Charley Schwab. The New York company consolidated fourteen claims, covering one hundred and seventy-eight acres in the saddle between Montgomery and Rainbow Mountains, and reached out and absorbed the Bullfrog Reduction and Water Company and the Goss and Davis Ranches, with their water rights on the Amargosa River, north of Beatty. By the end of 1905 the Montgomery-Shoshone Mine had been developed to a depth of one hundred and fifty feet and a large body of rich silver-gold ore was blocked out. Rhyolite was attaining its full growth as a lusty town. All Rhyolite needed was better transportation.

In the latter part of 1906 the Las Vegas and Tonopah Railroad reached Rhyolite. The Bullfrog-Goldfield Railroad was completed in the middle of 1907 and before the end of the year the Tonopah and Tidewater Railroad was in operation, and the Las Vegas and Tonopah Railroad had been extended to Goldfield. Rhyolite demanded transportation. Three railroads to a collection of huts on the desert in a little over a year. There was gold in the hills.

Ore shipments began as soon as the railroads were running. In November, 1907, the Montgomery-Shoshone Mine had ore on the dumps and ore blocked out that was valued at five million dollars, and was producing ore and concentrates at the rate of one hundred and fifty thousand dollars a month. As

the ore went out over the rails, other things came in. Rhyolite proposed to be a permanent and modern camp. There were ten thousand people in Rhyolite. They wanted concrete buildings, electric light and an ice plant. The boys and girls demanded good things to eat and drink. What Rhyolite wanted, Rhyolite bought. Stocks were booming. The New York Exchange was clamoring for printed paper from the Bullfrog mining district. You could sell anything. Or you could buy it.

Two miners lived in an adobe shack on the edge of Rhyolite. They had a cooking outfit, the clothes on their backs, two heaps of straw to sleep in, and a hole in the ground. The hole in the ground was a mine.

"Jim," said one of the miners to his partner, "I'm damn sick of this canned milk. We're rich men. We oughten to have to use this damn canned milk. You go and buy a cow."

"I don't know nothen about cows. An' what'll we feed it?"

"Never mind. We'll hire somebody to take care of our cow. You go get a cow some place. I'm damn sick of this canned milk. What this town needs is a cow."

They got their cow. When Mr. MacLaughlin bought the Rhyolite railroad station in 1927 to remodel it into a home, he removed the mummified remains of a cow from the waiting room. Some one told me that she missed the last train out of Rhyolite in 1908 and died waiting for the next one.

Rhyolite reached its greatest height in 1907. The railroads were in. The electric light plant was working. The banks were open. The concrete school house was almost completed. Modern stores and three-story office buildings formed the business district for three blocks along Golden Street. The mines were working and shipping and every citizen and floater had plenty of money. Stocks were still strong. The buying and selling went on day and night.

A man burst into a group that was having a quiet drink at a corner table in one of the leading saloons. "Here's a buy," he said. "I've got an option on the Hayseed Mine over on the Amargosa. They've got gold at the grass roots. We can have it for seventy-five thousand dollars. They want cash and my option is up at eight in the morning. Let's get together and buy it."

They got together. They raised the seventy-five thousand dollars without leaving the saloon and the man with the option hit the trail back across the Amargosa Desert to the Funeral Mountains to close the sale before his option expired. The new owners of the Hayseed Mine developed their mine. They had gold at the grass roots and in a very short time they had close to two hundred thousand dollars in the treasury. When the mine got down below the grass roots and the gold disappeared, the more conservative partners suggested that it might be wise to suspend operations and divide the profits. That idea was pure nonsense to the rest of the owners. Shut down before the main lead was found? Shut down with two hundred thousand dollars in the treasury and a whole mountain to work on? What kind of mining was that?

The holes they put into the Funeral Mountains looking for the main lead of the Hayseed Mine are very nice holes. But they are hardly worth the two hundred thousand dollars they cost. There are a lot of expensive holes in the hills around Rhyolite.

Under the stimulus of Rhyolite's virility and Rhyolite's gold, mines went down at other points in and around Death Valley. Some claims were staked in the Gold Belt district up in the Ubehebe Hills of the northern Panamints. The Ubehebes are copper property. Big copper property. The Guggenheims once sent an engineer in to look at the Ubehebe copper and he made

a very good report on the district. There was just one drawback about a mine in the Ubehebes. A pack train of trained eagles would be needed to get the ore out. But the Ubehebes will be developed some day. Caterpillars will haul the ore carts out in long strings. Some one will build a million dollars worth of roads first, but a million will be very small money when the copper comes out of the Ubehebes. Jerome and Bisbee will be just penny-ante copper towns. . . . I have been talking with men who own some of the Ubehebe copper claims.

In Rhyolite's day there was a little gold excitement in the Ubehebes. The Ubehebe gold claims were a long way from the railroad at Rhyolite. They were across the Amargosa Desert and the Amargosa Range, thence northwest across Death Valley to the Ubehebe Crater, thence up steep and crooked cañon trails to the high valley of the Ubehebe Racetrack, a giant playa of clay as smooth as a pool table. From the Racetrack the trails went up and up to the gold claims at Gold Belt. They were not accessible claims. I do not think that even a California realtor would have considered them close-in property.

A half a dozen men in Rhyolite threw in five hundred dollars apiece and secured a string of claims at Gold Belt. One of the owners of this string of claims was interviewed by the engineer of one of the big mining companies. In the absence of the other owners this partner talked to the mining engineer and had a funny story to tell his friends and partners when he next saw them. He said, "This engineer had been over to the Ubehebes and all over our property. He told his company it was good, so the company told him to offer us twenty thousand dollars for our claims."

"Did you take him?" It was said in chorus while five men divided twenty thousand by six and subtracted five hundred.

Twenty thousand for some claims which might just as well be on the moon. Of course he had taken the offer.

"Take him? Hell, no! I laughed at him. I saw he was interested so I told him our price was two hundred thousand."

He had been around Rhyolite too long. No one ever made another offer for the Gold Belt claims.

Rhyolite money went into the copper camp at Greenwater on the east side of the Funeral Mountains, far down the Amargosa Desert from Rhyolite. Originally located in 1884 as a silver-gold property, Greenwater was revived by the rise of Rhyolite with its easy money market, and was boomed as copper property in 1905. Rich copper outcrops were located and the magic of the names of Charley Schwab and Borax Smith boosted the population of Greenwater to over a thousand people within a month, with new citizens coming in out of the desert dust every day. The claims were spread out along the range for fifteen miles on each side of town and over five million dollars worth of them were sold. Greenwater had a bank, a post office, two newspapers, a telephone, intermittant and hair-raising automobile stages to Rhyolite, plenty of saloons and dance halls, and no reform league. Greenwater had everything that makes a mining town, except water and some mines. The nearest water was twenty-five miles away and all values disappeared from the ores a short way under the surface. Greenwater dissolved soon after the ores pinched out. There is very little débris on the mountain where Greenwater stood.

When Bob Montgomery sold the Montgomery-Shoshone Mine in Rhyolite, he moved west across Death Valley to Tucki Mountain. There he bought the holdings of Ramsey Mason and the town of Skidoo was born. Skidoo was a gold and silver camp; a live town with good mines. The ore was rich enough

to overcome Skidoo's isolated situation up on the Death Valley rim of the Panamints. Skidoo was cut off from Rhyolite by Death Valley, the Amargosa Range and the Amargosa Desert; and blocked from the west by Panamint Valley and two mountain ranges. The ore had to be rich to cross those barriers. All of the Skidoo claims were amalgamated into a single holding and the work of development begun. Water was piped in over eighteen miles from Telescope Peak. A bank and newspaper were established. The telephone poles still stand in places across the Amargosa Desert and in Death Valley where the copper was strung up Telephone Cañon to link Skidoo with Rhyolite and the Stock Exchange. Three million dollars went into the ground at Skidoo and six million came out.

Skidoo is the Death Valley town that had the hanging. A bad man was hanged for murder. The bad man got very drunk and went into the bank demanding some money. Some say that he had money in the bank and that it was after banking hours; and others say that he never had any money any place. He was not given any money and he killed the man who refused him. There was no law in Skidoo to punish the bad man, so a committee of citizens took care of him. The committee was a product of popular sentiment. Skidoo was a broad-minded town and there was plenty of room for a man to have his fun. Skidoo believed that it was all right for a man to whoop it up and have a good time, but Skidoo drew the line at murder. There were too many wild buckaroos in town who needed only a little encouragement to start them kicking the top right off the mountain. Skidoo did not intend to have any of that. Skidoo made an example of the first murderer.

The committee of citizens hanged the bad man and made an announcement. The committee wanted it known that the rope would be kept handy and the committee would be very glad

to use it on any of the bad man's hairy-chested friends who thought that the committee was hasty or high-handed. While the bad man swung on his rope all that night there was a slight decrease in Skidoo's population, as some of the curly wolves who were close friends of the deceased left for other towns.

In the morning, after the bad man had been cut down, a man came along with a camera. They hanged the bad man again and took his picture.

The Skidoo hanging was the only verdict Judge Lynch handed down in the valley towns. Men went armed and there was gunplay in Rhyolite and Greenwater and Beatty. Once in a while some one was found shot in the hills. There are a number of murder mysteries in Death Valley which never have been cleared up. At the time, they were explained to every one's satisfaction as grudges, meanness, or too much sun. When a man was found shot to death, he was dead. There was gold to be mined.

Every now and then a drunk took over Golden Street in Rhyolite and owned it as long as he swept it with lead. Everybody cussed him, but it was rare for anyone to swap shots with him. The residents rather enjoyed it and they kept out of sight until the drunk ran out of ammunition or got tired and lay down. Then they put him away to sober up. If he did it too often and became a nuisance he was presented with a canteen. Giving an undesirable a canteen was a simple and effective method of getting a man out of town. A small delegation waited upon the unpopular individual and asked him if he had a canteen. He knew what that meant. He walked to the edge of town, surrounded by his escort. If he did not own a canteen, the escort gave him one. At the edge of town the escort said, "Good-by. Don't come back." The man who had been pre-

sented with a canteen walked down the trail into the desert. He did not come back.

Rhyolite and Greenwater and Skidoo issued a number of canteens. They might have given out more. Rhyolite had Diamond-Field Jack, who had been sentenced to hang five different times. Diamond-Field Jack was a bad hombre. Jack got drunk and shot up Golden Street. He stood on the corner and invited all the thises and thats in town to stick their heads out so he could shoot them off. Jack was not fooling. MacDonald, the sheriff, walked down the street with Jack looking right at him.

"Don't come any nearer, Mac," said Jack. "I'll kill you. I'll kill you just as sure as hell."

"Gimme your gun," said Mac. "You're drunk." And MacDonald took the killer's gun away from him. MacDonald was that kind of a brave fool. He had no imagination.

Shortly after MacDonald disarmed Diamond-Field Jack, one of the miners on the west end of town went on a wild bust and started to change things around. First, he wanted a new wife. He told his wife he was tired of seeing her around. It was time for her to go. He assisted his wife's departure by moving all her clothes and possessions out into the middle of the street. His wife objected violently and when he poured kerosene on her things and set fire to them, she began to claw his eyes out. The miner got a miner's candlestick and killed her.

A miner's candlestick is not an ornament. It is a weapon. Miner's candlesticks are forged by the blacksmith out of wrought iron. They were eight to ten inches long and tapered to a sharp point, rugged enough to be driven into the hard-packed earth of underground workings. No miner was ever unarmed as long as he had a candlestick. Men were always seriously hurt in every miners' brawl.

Photo by Walter Fiss

ENTRANCE TO INDIAN CAÑON

Some one told me how many times this drunken miner in Rhyolite stabbed his wife with the candlestick. I did not want to remember. When MacDonald, the sheriff, heard of the murder, he said, "I'll go down and get him. He'll come with me."

A friend said, "Mac, you use your gun down there."

"I won't have to," said Mac. "We're old friends. He'll come with me."

"You may be old friends, but that man's hog wild. His wife is dead and he's pullen his house apart before he starts in on the rest of the town. You use a gun."

Quite a crowd went along to see what would happen. One of the sheriff's friends, who did not want to see MacDonald commit suicide, brought a shotgun and stood beside the sheriff when he stopped outside the miner's house and called, "It's me, Tim. It's MacDonald. You come along with me and no more trouble. I'm comen in, Tim. And I haven't got a gun."

"I got one," says the miner. "An' you stay the hell out of here!"

MacDonald said, "I'm comen in." And he walked into the house. He got just inside the door and the miner sprang at him. The man behind the sheriff with the shotgun blew the crazy miner in half. MacDonald was a good sheriff, but he did foolish things.

Clayton was the bad man of Rhyolite. He was an intense friend or enemy even when he was sober. Gunplay was a hot passion sweeping through his blood like some hideous disease. He was a killer. He seldom spoke when he was sober but drink maddened him and released a flood of abuse from his tongue. His gun was always handy and was often in his hand. Wise men walked around him with deaf ears. They knew him for the dynamite he was.

Clayton sat in a card game one day quite drunk and drinking. Sullivan, the bartender, brought a round of drinks and Clayton's change. Clayton accused Sullivan of short changing him. Sullivan was a dirty thief. Clayton kicked Sullivan about, reviling him with filthy names. Sullivan took the abuse. When Clayton ended his tirade, Sullivan walked quietly behind the bar, picked up a gun and shot Clayton.

Clayton struggled to his feet and drew. Gunman and bartender stood there and emptied their guns into each other, closing in as they fired. Five shots apiece. They clinched and dropped to the floor fighting. They had to be pried apart after they were dead.

Gentler characters lived quietly in the valley towns of gold and frenzy. There was Joe Ward in Rhyolite. Joe was one of those rare individuals who can walk along staring wide-eyed at the sun. Naturally, they called him Suneye Joe. Joe was a poet. The meals that one of the mines fed its men were pretty bad. Joe wrote a poem about the rich mine and the poor chow, and the stingy mine owners and the starving miners. The poem became so popular and amused so many people that the mine began to set a better table. Joe Ward's poetry was powerful.

The inaccessible south end of Death Valley was close enough to the excitement at Bullfrog and Skidoo to share in the general boom in mining. Jack Salisbury promoted The Carbonate Mine in the Death Valley side of the Panamint Range, south of Wingate Pass. The ore was a high-grade silver-lead carbonate. The shipping route from the mine ran east across the sink of Death Valley, but that did not present too great an obstacle to the mining company. The company built many miles of double-boarded road to Zabriskie, on the Tonopah and Tidewater Railroad. The mine was far from civilization in barren country, but the harsh situation was improved by a landscape gardener's

efforts to create an oasis. Comfortable bunk houses went up and tennis courts and a swimming pool were built.

The Carbonate Mine brought the first tractors into Death Valley. They were steam tractors, enormous three-wheeled affairs, with a great vertical boiler mounted between the massive rear wheels. They were so heavy they would not pull their own fuel and water. One of them, stripped of its engine and most of the parts which could be carried away, lies beside the road in Daylight Pass. The others are scattered about the valley, rusted reminders of a giant idea. The Carbonate Mine was worked at late as 1915, but the tractors were never any great help.

The Panamints had other mining activity at Harrisburg, where Shorty Harris, the discoverer of Bullfrog, made another strike on the fourth of July, 1905. The Panamints also still hold one of the best mines in the entire valley district. The Le Monge Mine. It was located by old John Le Monge in 1882. John's mine missed the boom development. Old John was not a man to be carried away by the ballyhoo and hysteria of a boom. He had been around Death Valley since the seventies. Before that he had spent many years at sea. Tiring of the sea he went to the desert. John was a straight, six-foot Frenchman, with a square-cut beard covering his chest. John took over his mine from the Indians. The mine had long been the Bullet Mine, in which the Indians cut lead ore to make bullets for their muzzle loaders. The Indians called John Le Monge the Bullet Mine Man. John never did much work on his mine. He just held on to it through the years. As he got older he wanted to sell the mine. John was a Frenchman, and as he aged he often thought of going back to France. To Paris. He wanted to die in Paris.

The boom in Rhyolite sent buyers to John Le Monge's mine.

They looked at the ore body and talked money with John. An engineer in the party of buyers said, "We'll give you eighty thousand dollars for your mine. Here's fifteen thousand dollars to close the deal." And the engineer took out his wallet and put a sight draft for fifteen thousand dollars in John's hand.

Old John looked at the piece of paper. He was dreadfully disappointed. He shook his head from side to side. These people who wanted to buy his mine did not have any money. They wanted his mine for a piece of paper.

Old John said, "This isn't money. I want money for my mine." John came from country folks and had never been in a bank.

The men who were anxious to buy John's mine could not persuade him to go to Independence with them to get cash. John did not believe they had any money, and old John's stubbornness exasperated the prospective buyers. John never sold his mine. And he never saw Paris. He died in the sun beside the Furnace Creek Trail in June, 1918. His burros were tied to the mesquite where John made his last Death Valley camp. His burros died with him. Death Valley men remember John Le Monge. He was part of the country in the old days; a fine old gentleman.

A great many of the graves along the valley trails were built for men who perished during the scramble for wealth between 1904 and 1908. "It was awful when Rhyolite and the other towns was goen strong," said Bill Corcoran. "There's those graves all over the valley and there's lotsa people died out there we don't know about. The weather just dried them out and these sand storms come. The greenest kids in the world would come out to Rhyolite and get a pack outfit and go out on the desert. They wouldn't know how to pack a boorow, or even

tie them up. Some one put up a big sign at Surveyors' Well sayen, 'Tie up your boorows.' Men would come into the well and read that sign and forget to tie them up. In the mornen the boorows would be gone and the men would go out looken for them. The boorows would come into town and then we would go out looken for the men. Sometimes we found them.

"You wanna remember they was no roads in the valley then and it was a lonesome place even if they was a hundred prospectors foolen around in the hills. Thirty or forty days and you wouldn't see a soul. And these fools not knowen better would be packen around the valley in the summer. In the daytime. Out in that sun. They was so many found dead that you couldn't pay any attention to them. Most a them ran outa water.

"Now a boorow always knows where there is water. But he won't tell you about it. He won't lead you to it even if you ask him to, but if you get in trouble and feel yourself goen and tie your arm to your boorow he'll get you to water. The boorows saved lotsa lives in this valley.

"Some of them that was found dead duren the boom days was fellars that had been in the valley long enough to know better. Bill Ryan. Bill was an old prospector up to the Keane Wonder Mine. Bill had been up in Rhyolite on a big drunk and he come down to the Keane Wonder and from there he started to Furnace Creek. I guess he knew he was goen to die because he lay down close to the road so some one would find him. He died between the time the wagon left Furnace Creek in the mornen and when I come across the valley that night. I stepped on Bill in the dark. Like to scared me to death. I thought it was a mattress and I lit a match. And there was his eyes staren up at me. God! It was horrible to look at! His whiskers was sticken up at me! I went back to Furnace Creek

Ranch and woke up the first person I come to. I wanted company. It was Jess Jackson. He woke up the rest and they got out a wagon and buried Bill. They wrote the judge about it. They was no jury then.

"Pete Bush and his partner died right near Stovepipe Well. Pete telephoned from Skidoo to a friend in Rhyolite that they was driven across the valley and said, 'If we don't get in, come out and look for us.' They found him dead in the shade of his car. There was water in his canteen and in the radiator of his car. They found his partner over by Hole-in-the-Rock Spring. He got crazy and wandered off that way. This valley is hot in the summer time."

I asked Bill, "The valley almost got you, too, didn't it, Bill? How long did you go without water?"

"From Friday to Monday," said Bill. "That was Harry Stimler and me up at the Le Monge Mine. It was August, 1920. Friday the thirteenth, it was. I'll never forget it. Three days wanderen around outa my head with angels flyen alongside a me pouren water out of a silver pitcher into a silver bowl. I could hear the rustle of their wings and the splashen water. I could see more water than I ever knew was on earth before. Water was runnen in all directions, and I could hear it rainen plainer than it ever rained when I was at myself. I'll never come closer to dyen and not go. I musta fell down all over the country; I busted my ribs and cut my head on the rocks and threw away my shirt and one shoe and didn't know it.

"When they found me and got me out to the Lane Mine near Darwin, I sorta come to. I couldn't talk, my tongue and throat was swollen so. And then some one had forced tomato juice down my throat and that just burned a streak right down me. But I could hear all right. I heard the doctor tell the people at the mine that I would be dead in a couple of hours and for

Photo by Walter Fiss

OLD HARMONY BORAX WORKS AND FUNERAL MOUNTAINS

them to notify the coroner. God! That was awful! And I couldn't even mumble.

"I was forty days in the hospital. In those three days I was wanderen around in the desert I went down from one hundred and eighty-five pounds to one hundred and twenty-six pounds. Sixty pounds in three days was what I lost. That's some dryen out. They kept me wrapped up in wet blankets, soaken up water like a sponge and fed me ice cream through a silver tube. I ain't eat any ice cream since."

During the rushing years of mining booms the Death Valley towns attracted unlimited financial backing and the enthusiasm of miner and prospector engendered an amazing confidence. Money was easy and the future was golden. Money had no value. It was something to be used to find and develop the mines. Money provided conveniences and let the idea-men carry out their ideas. When a man ran out of money he asked somebody for more. Anybody. And he got the amount he asked for. There was no inquiry about what he wanted it for and security was just a word. The panic of 1907 ended all that.

The boom was at its height in Rhyolite. Every one went to bed one night with their fortunes secure. They woke up the next morning, broke. There was no money in the banks. There was no credit. There was only a great mass of handsome stock and a lot of ore in the ground. It was an unbelievable condition. The country, the mines, the town, and the people were exactly as valuable as they had ever been but they were not worth a dime in the market. There was no market. It was probably a temporary depression. Rhyolite went to have a drink and wait.

The wait was too long and the exodus began, gradually at first, as business left its typewriters and telephones and closed its offices until the depression was over, but swelling into a rush

out of the dead quiet of the town as the residents grew tired of waiting. They still had confidence in Rhyolite, but they were getting hungry and thirsty and every one else seemed to be leaving town. Trains stopped running to Rhyolite. The railroad iron was torn up. Rhyolite fell into ruins. Rhyolite is an interesting skeleton. Some of the old properties have been reorganized. There is stock for sale in the reopened mines.

Death Valley had another boom in 1925 and 1926 at Leadfield. Leadfield is in Titus Cañon, on the valley side of the Grapevine Mountains, north of Surveyors' Well. The ore at Leadfield was a low grade lead ore. On the Western Lead property the ore is one hundred feet thick and runs about seven percent lead. There are millions of tons of it. Leadfield did not die because of lack of ore or want of transportation. Leadfield died of complications.

Leadfield's water supply was an interstate proposition and a cause of trouble and expensive delays. The corporation commission investigated stock sales after several million dollars worth of stock was sold. The complications became acute and the price of stock declined. The promoters spent almost three million dollars buying up stock in support of the market price. There was no money left for Leadfield. Miners tell me that Leadfield will be a big mine some day.

Leadfield, in its brief existence, threw a road into new country. The Leadfield road runs north on the Amargosa Desert into the high hills of the Grapevine Mountains, sweeping around the shoulders of vertical cliffs to reveal a succession of unexpected valleys cut deep in the startling rocks of the range. Up in the little pocket in which Leadfield lies, the road joins the natural gravel trail down Titus Cañon into Death Valley. The mountain sheep along the Leadfield road outnumber the travelers. The Bonanza Tunnel in Western Lead runs into an

enormous cave full of crystals. The Leadfield road cost one hundred thousand dollars. It is worth it.

There will be other mining booms in the hills of Death Valley. The mines and the miners are waiting. Some of the miners have been sitting on rich claims for twenty years. The old valley men are dying off and a new kind of prospector and miner is replacing them. The newcomers are a breed of smaller men. There is something cautious and petty about them that the old desert men do not understand. The new breed is making money in the hills where the old prospector lived.

The old timer lost his sense of values during the boom days. He still thinks a dollar is something to spend. If he does not have one to spend, he gets along without it and hardly misses it. Ten dollars or ten thousand dollars are much the same to him. They are sums of money representing nothing very tangible. The desert man's philosophy is very comforting to the desert man. The business man who encounters it very often goes off biting his finger nails and making uncouth growling noises.

Little Charlie is one of the desert clan. He is called Little Charlie to distinguish him from Big Charlie. Little Charlie and his partners have a mine in Tucki Mountain. It is a good mine but it costs Little Charlie money every year. He works to earn money to put in the mine. A wholly unexpected buyer came along and offered Little Charlie twenty thousand dollars and a substantial interest if Charlie would deed the mine over. Charlie declined the offer and went on hauling wood and running surveys to make more money to put in the mine. A friend of mine asked Little Charlie, "Why didn't you sell, Charlie? How much do you want for that fool mine of yours?"

"My price," said Little Charlie, "is one hundred and twenty thousand dollars and no back talk."

Little Charlie was in no hurry to sell. He has plenty of time. He has all the time in the world. There will be another boom in the valley mines. One million is a nice round number.

Summer was coming on and I was leaving Death Valley. I ran into Bill Corcoran. Bill said, "You'll come back. Sure. What you oughta do while you're in town is get somebody to stake us. We'll go prospecten. We could do it on three hundred a month. We'll find another Goldfield. I know we can do it. And we won't have to look far either. We'll find the biggest gold mine in the world. Sure we will!"

There are undiscovered mines in the valley hills.

PLANTS AND ANIMALS

She was demure and very friendly, a one-hundred-and-ten-pound blonde, perfectly thrilled by Death Valley. She wore a polo shirt, white corded breeches and polished cordovan boots. She was ready to hike across Death Valley on her very own. She was talking to a man who looks like a perfect desert character. She wanted to be sure that no snakes would spoil her hike.

"You better put on a hat," said the perfect desert character. "This sun does things to people who run around bareheaded. And get a smaller canteen; that one you're carrying will weigh fifty pounds before you get back. And you'd be a lot more comfortable in skirts. Those boots will be hot, and those breeches will have you chafed raw in spots."

"You haven't told me about the snakes."

"No snakes," said the perfect desert character. "Bill Ball's the only one I know that was ever bothered by snakes in the valley. Bill was working a placer up in Tule Cañon and the snakes almost drove him out."

"What kind of snakes?" she asked.

"Rattlesnakes. Big ones. Bill said he was so busy fighting snakes that he did not have time to work his claim. Finally he just stopped bothering with them and let them come right on in to his place. Then whenever there was enough of them around he gathered them up and spliced them together and used them for a rope."

The demure little girl looked at him and said, "I guess you're right. About the sun, I mean. I'll go put on my hat."

CHAPTER SIX

PLANTS AND ANIMALS

STRANGERS have suffered thirst in the deserts and mountains of the Death Valley region. Men have died from lack of water in Death Valley. Popular fancy has pictured Death Valley as a waterless land without life or vegetation. Yet, the water is there. Native races, native animals, and native plants find water enough in Death Valley to sustain life. There is no profusion of water, or animal or plant life. The vegetation is scant enough, and the animals are so seldom seen that they command attention when they do appear. The existence of plant life and the appearance of animals against the background of the vast, empty land awakens a much more lively interest than their presence does in more prolific regions where the individuality of plant and animal is lost in crowded growth. Death Valley trees, and shrubs and plants live under a bright, white light, with every detail of growth and bloom sharply revealed against the dead, burned land. Death Valley animals pose and move importantly. They own the trails and the hills.

Dr. Frederick Vernon Coville, of the National Herbarium, in his botanical survey of the valley, lists one hundred and thirty-six species. Forty-eight of the total are plants in the paludose group, and there are eighty-eight species of arid flora. Of the forty-eight paludose species, two are trees, thirty-two are perennials, and eight are annuals. These paludose plants cannot be considered representative of the true arid flora of the valley, because all of them grow only where there is abundant

water. Very few of the paludose species are confined to the desert, many of them are native to the humid regions of California, several extend their growth across the entire southern part of the United States and south into Mexico, and still others are rooted throughout the subtropical regions of the world.

The second group of eighty-eight species of typical desert flora includes eighteen perennials, twenty shrubs, and fifty annuals. Of the eighteen perennials only one, the Buffalo Gourd, *Cucurbita palmata,* is a true perennial and as it does not grow in arid parts of the valley it is classified as a moist soil plant. Of the other seventeen plants classified as perennials, fourteen are woody at their bases and perform their life functions above ground throughout the year, and the three remaining perennials are grasses with stems, which retain their vitality through the winter. The true desert flora of Death Valley is found in the twenty shrubs and fifty annuals, which are the only two types of vegetation that can adapt themselves to the extreme heat and dryness of the valley climate.

The representative species of the Death Valley flora grow in the hottest and driest climate in the United States, and all the vegetation shows some form of adaptation to its environment of intense heat and light and a rainfall of less than an inch a year. The valley plants have insured their life periods of reproduction, dissemination, germination and growth by developing special adaptations to meet the adverse conditions of their environment. The shrubs of the valley, which have been exposed to the pronounced seasonal changes for many years, are the true representatives of the arid vegetation, and as such they have developed the most marked modifications to combat the consuming heat and light of their environment.

Reproduction is no more difficult to desert growths than it is to plants of evener climates. Pollination, too, is accomplished

Photo by Walter Fiss

BORAX FLAT NEAR SALT CREEK CROSSING

through the same agents of wind and insect as in other regions. Insects are numerous enough in the valley to conduct many of the necessary flower visits, so that wind-fertilization or self-pollination are not unusually prominent. Adaptations begin to appear when the plant life period of dissemination is reached. Seeds and fruits light enough to be moved over the surface by ordinary breezes are distributed by the wind. Wind distribution accommodates many desert plants such as the Desert Aster, *Aster abatis,* the Short-spine Horsebrush, *Tetradymia spinosa,* the Creosote-bush, *Covillea tridentata,* and the Bladderbush, *Salizaria mexicana. Erigonium triclopes* breaks off at the stem and the entire plant is blown over the desert as a tumbleweed. The fruits of the Littleleaf Ratany, *Krameria parvifolia,* the Bur-sage, *Franseria dumosa,* and the Sandpaperbush, *Petalonyx thurberi,* are armed with barbed thistles which catch in the fur of animals, to be transported long distances before they drop from the animal's coat to extend the growth of the specie.

The most serious problem of the shrubs of Death Valley is that of ordinary vegetative growth. Light and food are abundant. Too abundant. But there is no moisture in the air and the amount of water in the soil is far below the normal requirements of unspecialized vegetation. Any living plant absorbs moisture from the soil through its roots, carries the moisture along its stem and transpires it by evaporation from the stomata of its leaves. Several vital functions of the plant depend upon proper transpiration. Transpiration is essential to the growth of the plant. If any plant of ordinary structure were exposed to the climatic conditions of Death Valley, it would wilt, dry up, and die—the hot dry air about the plant would draw more water through the leaves than could be supplied by the roots, the soft tissues of the plant would lose their turgescence and the vital functions of the plant would cease.

To sustain life, and growth, the plant must absorb water from the ground at least at the same rate at which it transpires water. Death Valley shrubs meet the severe heat and dryness of their environment and accomplish a balance between the water absorbed by their roots and the amount of water transpired by increasing their means of absorption and reducing the rate of transpiration.

The astonishingly great root systems of desert plants is exemplified by the Deerhorn Cactus, *Opuntia echinocarpa.* The deerhorn cactus is a common aborescent cactus in the Death Valley region. It grows from one to five feet high with profuse, spined branches spread like the horns of a deer. Dr. Coville investigated the root system of a deerhorn cactus. The specimen he examined was only nineteen inches high, but its roots were spread in a network, with a diameter of eighteen feet. The roots were about three inches below the surface, where they took advantage of the slightest rain and absorbed all the moisture the cactus could store, before the water disappeared into the parched air and soil. Other desert plants send their roots into the ground to great depths searching for water. The Mesquite, *Prosopis juliflora,* in the sand dunes of Death Valley, has a multitude of water-searching feelers one hundred feet in length. One specie of acacia shrub has developed a double root system, in which one series of roots is spread in a wide horizontal network, and the second series grows directly down into the soil. This double system of roots absorbs water both from light precipitation and from deep percolating water in the sand.

These devices which desert plants have developed for the absorption of water are remarkable, but the modifications the plants have made in their structure to assist them in retaining the moisture they have absorbed are more remarkable. Desert

plants reduce transpiration by a variety of methods and structures. They curtail their yearly growth. It may be argued that this reduction of growth is a natural outcome of reduced potential, rather than a plant modification to lessen evaporation. The effect is the same; there is less transpiration. The desert plants cut down evaporation by producing only small leaf surfaces and by growing a thick spongy bark. Some of the desert plants which bear non-transpiring leaves and transpire only through their stems, have reduced the bark of their transpiring stems to an epidermis that covers the green chlorphyllose, assimilative tissue. Others reduce the period of transpiration by shedding their leaves very early in the summer. The creosote-bush varnishes its leaves with a resinous exudate.

Death Valley, like all deserts, experiences abrupt changes in temperature. After sunset the temperature of surface objects drops sharply. After sunrise there is a quick increase in temperature on the surface. The valley plants meet these extremes of radiation, which would be fatal to a growing plant of ordinary structure, by equipping themselves with hairy coverings and by insulating themselves with air spaces in their protective structure.

The creosote-bush, which has solved the problem of excessive evaporation by varnishing its leaves, is the most conspicuous and most widely distributed shrub in the valley region. It grows from two to six feet high, an aromatic evergreen with graceful branches and gray stems carrying small green leaves. In March and April it blooms with numerous single flowers of vivid yellow. The best growths of Covillea on the floor of Death Valley are in the flats between the sand dunes at the north end of the valley. There in the hollows between the tawny sand dunes I have seen the creosote-bush growing to the unusual height of ten feet, sending tall fronds of luxuriant

green foliage curving upward from the patterned yellow and white of the borax flat.

The creosote-bush takes its name from the resinous coating on its twigs and leaves. The coating closely resembles ordinary shellac, and when the green wood and leaves of the bush are burned there is a dense smoke with a pungent odor. The function of the resinous coating is to reduce transpiration. The coating is thickest in the winter and spring and thins away in the summer after the seasonal growth of the plant has been accomplished. Herbarium specimens of the creosote-bush do not produce the resinous varnish, which is so conspicuous upon the same bush when it is growing in its desert environment.

The creosote-bush belt throughout which the bush is the most common growth includes the principal area of the desert region. It embraces the gravel fans, the wide mesas, the gentler valley slopes, and the greater portion of the broad desert basins. The soil of the mesas is gravel for the most part. The steeper portions of the mesas may be boulders and the more horizontal areas often are a fine even quality of gravel and soil. The character of the soil changes according to the rocks in the region, from which the soil was derived, becoming prevailingly limey, metallic or siliceous as the structure of the hills changes. The vegetation on the desert slopes and mesas is exposed to typical desert conditions; there are no sheltering rocks to shield the growths and no springs or other immediate sources of water near the creosote-bush and its associated vegetation—vegetation that is true desert flora.

The Bur-sage, *Franseria dumosa,* is a common associate of the creosote-bush, and at the upper edge of the creosote-bush belt the bur-sage becomes a prominent shrub. The bur-sage is a small, round gray bush with a resinous odor. Where creosote-bush and bur-sage grow in the same zone, the dark green,

lacquered leaves of the creosote-bush contrast sharply with the light gray of the low bur-sage bushes. In favorable locations the creosote-bush will be from two to six feet high and the bur-sage about a foot and a half high. Most of the other desert species will fall in between these height limits. In locations of extreme aridity, the height of all desert plants is decreased, and the space between the plants increased. The individual desert shrub is almost always well separated from its nearest neighbor and the growths are never close enough to crowd or shade one another. The wide spacing of desert vegetation possesses more significance than is usually attributed to it.

The spacing between desert shrubs varies with the degree of aridity of the soil, because the moisture of the soil of any specific area is sufficient for the support of only a certain number of plants. Most of the Death Valley areas which support plant life have been undisturbed for long periods of time, so that the number and spacing of the shrubs on any particular expanse of ground is very likely to represent the maximum plant life that can keep alive year after year in that area.

The symmetrical form all desert shrubs attain is the direct result of their wide spacing. Surrounded on all sides by light they develop equally in all directions into a final rounded or globular form, from which there is almost no departure on the desert. Light loving plants in other climates are often rooted in shaded situations, where they must grow tall enough to reach the light above the shading body, and in extending their growth upward they fail to develop the rounded outline that is characteristic of the desert shrubs. Creeping or cone-shaped shrubs are rare in the desert. Many desert shrubs have a well-defined trunk and appear to be trees in miniature, but most shrubs grow in the form typical of the desert, with diffusely branching stems arising from a common base at ground level.

The creosote-bush and bur-sage grow on the mountain slopes and through the mesa lands of Death Valley, almost as high up as the altitude of the lower limit of timber. Other plant life shares this belt with the creosote-bush. The littleleaf ratany is plentiful in the gravel soils. It grows about two feet high and in midspring great numbers of fragrant purple flowers burst into bloom among its inconspicuous gray leaves. The gray Burrobush, *Hymenoclea salsola,* with its downy leaves, is common in the sandy washes and in alkali soil. The Anderson Wolfberry, *Lycium andersoni,* lives in the upper valleys of the region. On the gravel mesas in alkaline soil there is a profusion of the beautiful Desertholly, *Atriplex hymenelytra.* Among the annuals growing on the mesas are Hedgemustard, *Sisymbrium officinale,* Indian Wheat, *Plantago patagonia gnaphaloides,* Desert Coreopsis, *Leptosyne bigelovii,* the Desert Sunflower, *Encilia eriocephala,* and the Dwarf California-poppy, *Eschscholtzia minutiflora.*

Above the gravel mesas in the cañons and on the rocky mountain slopes there are other species. Among the shrubs are the Rabbitbrush, *Bigelovia paniculata,* and the Goldenweed, *Aplopappus interior;* the perennial Sandwort, *Arenaria macradenia;* and Desert Tobacco, *Nicotiana trigonophylla.*

The true aromatic Sagebrush, *Artemesia tridentata,* grows on the mountain slopes and in the upland valleys. The sagebrush has few equals as a social plant. In upper desert regions it often occupies thousands of square miles and almost excludes all other plants but the humblest and least conspicuous forms. In these areas the air is always heavy with the aromatic scent of sage. Growing in a narrow belt between the creosote-bush belt and the sagebrush are a number of striking shrubs; the dark Blackbrush, *Coleogyne ramosissima,* the handsome Shortspine Horsebrush, *Tetradymia parvifolia,* and the beautiful White

Photo by Stephen H. Willard

THE SINK OF DEATH VALLEY

Horsebrush, *T. comosa.* In the higher areas of the desert the shortspine horsebrush is easily identified by its long yellow spines. In early spring it is dressed in handsome green foliage, green woolly leaves, and pale yellow flower tubes. Later in the season its greatly tangled branches are covered with tufts of soft feathery plumes. The white horsebrush is low and rigid but can be distinguished even at a distance by its almost white foliage. The horsebrushes are often companions to the Bladderbush, *Salazaria mexicana,* which in early spring bears showy flowers with a lilac and white upper lip and a dark blue lower. In age the calyx of the bladderbush becomes enlarged into an inflated capsule tinged with yellow, pink or lilac, which is borne away by the wind to lodge in great numbers upon the spines of the other desert growths.

The surface of the salt marsh in Death Valley is devoid of vegetation, but from its margin a succession of growths extends in well-defined bands across the valley floor and up the alluvial fans of gravel into the cañons and up the sides of the mountains. At Bennett Wells in the southern portion of the valley on the border of the salt marsh there is first a strip a few yards broad of the Pickleweed, *Allenrolfea occidentalis.* The succulent pickleweed can endure more alkali than any other plant. It is almost leafless with smooth and many jointed branches, and fleshy, scalelike leaves. In bloom it is crowded with small, gray-green flowers which turn red-brown with age. The wind drifts the sand through the branches of the pickleweed and the plant anchors the sand to form hummocks three feet high and nine to twenty feet across.

In the strip beyond the pickleweed the rigid, erect Cooper Rush, *Juncus cooperi,* and Saltgrass, *Distichlis spicata,* grow. The Dropseed, *Sporobolus airoides,* forms the next belt one thousand yards wide outward from the salt marsh and the salt-

grass becomes more profuse. Both saltgrass and dropseed are eaten with apparent relish by grazing animals.

Further outward from the salt marsh the alkaline crust on the soil diminishes and the surface becomes sand, which tapers into gravel as the alluvial fans are approached. Mesquite, *Prosopis juliflora,* the Fourwing Saltbush, *Atriplex canescens,* and the Seepweed, *Suaeda suffrutescens,* grow in a belt about a thousand yards deep.

The mesquite is a widely branching thorny shrub or tree with a rigid, tough stem well armed with large spines. Mesquite grows in clumps from two to ten feet in height and further north in Death Valley there are heavy growths of mesquite in the sand dunes, where the wind-blown sand has accumulated around the base of the shrub while the branches grew upward. The sand dunes are full of knotted roots which are excellent firewood. Death Valley is one of the few places in the world where the camper must dig for his wood and climb for his water. The fruit of the mesquite is a nutritious pod. The Paiute Indian ate it and it has been fed to horses in place of grain. The common mesquite and the smaller Screwbean, *Prosopis pubescens,* with the spirally coiled fruit pod which gives it its name, are both commonly classed as trees. These two mesquites and the Cottonwood, *Populus fremontii,* are the only trees indigenous to the lower arid regions of Death Valley.

The shrubby gray fourwing saltbush is untidy and stiff. It grows from one to three feet high. Its bleached branches carry small gray leaves which are narrow and fleshy and bear small, yellow flowers and bright green seed vessels. The seed vessels dry to a straw color and each bears four wings to aid its aerial transportation.

The creosote-bush takes up its growth in the slightly alkaline soil of sand, clay and gravel at the foot of the alluvial washes

and marches steadily up the mountains. The desertholly grows profusely on the desert edges of the creosote-bush belt, and the bur-sage, the burrobush, and the Cigaretteplant, *Eriogonum inflatum,* accompany the creosote-bush up the gravel washes into the mountains. The green leaves of the cigaretteplant grow at the base of the slender stemmed plant. A portion of the slender stem below the yellow flower is inflated, and as the plant dries out during the winter months, the inflated portion of the stem bleaches to a yellowish white and resembles a cigarette.

Above the belted growth of the creosote-bush in the mountains there are varieties of shrubs; the blackbrush, the Desert Almond, *Prunus fasciculata,* the Jointfir, *Ephedra nevadensis,* the Winter-fat, *Eurotia lanata,* the Spiny Hopsage, *Grayia spinosa,* and the two horsebrushes. This is also the belt in which the Joshua-tree usually florishes.

The desert almond, growing in the cañons and on rocky slopes, was known to the Mormons as the wild almond. It grows in dense clumps about six feet high with irregular, very tough and very spiny branches. Its flowers are white and its fruit resembles a small almond. The jointfir is from one and one-half feet to three feet high, with numerous jointed and spreading branches which are pale green in color and which bear small, scale-like leaves. The spiny winter-fat is from one to three feet high, with stems which are woody at their bases. The rigid, spreading branches of the winter-fat and its fleshy leaves are covered with a growth of hairs. In other regions where the hills support grazing herds, winter-fat furnishes an excellent winter feed. The spiny hopsage is a solid shrub about three feet high. Its angular and spiny branches are interlaced and are crowded with small, pale green leaves that are thick and fleshy. The seed vessels of the spiny hopsage turn

various shades of pink and are numerous enough to give the entire shrub a distinct pink tone.

The Joshua-tree does not grow in Death Valley proper but it is sometimes found on the high mesas behind the ranges of the valley. The Joshua-tree grows from four to fifteen feet high and branches in a peculiar and characteristic manner. The Mormons said that the tree pointed on toward the promised land, so they called it the Joshua-tree. An occasional solitary Joshua-tree stands on the skyline of a hill with only two branches thrown up to the sky at angles of forty-five degrees, and from a distance has every appearance of a man with supplicating arms outflung to the sky. The stiff leaves of the Joshua-tree have a terminal thorn, are set closely together and overlap on the branches. As the tree grows the leaves die and gradually bend downward until their thorny tips are extended from the branches which they surround like a belt of bayonets. Later in the year the leaves fall off and the trunks and lower parts of the branches are bare. The Joshua-tree was a general store to the Paiute Indian. The buds were a delicious food and the tough fibers were woven into ropes and nets.

The Death Valley region has comparatively few trees. Only the higher peaks in the Panamint Range and on Grapevine Mountain are capped with coniferous timber. Seen from the lower altitude of the desert valleys the high woodlands have a lower timber line that is clearly defined. Above the almost horizontal line are the sparse forests, below it the mountain slopes are bare of any timber. Dr. F. V. Coville has suggested that the lower limit of timber growth is explained by the winter storms of Death Valley. The storms on the mountains first appear as clouds masking the summits of the ranges. Later, when the clouds are gone, the mountains reappear with snow-clad crests, and on the timber-bearing mountains, the lower edge

of the snow runs straight and true along the lower limit of tree growth. Below the clearly marked snow and timber line, the precipitation was rain which quickly ran off down the barren slopes into the dry valleys below. Snow does fall on the desert floor but it is gone as soon as it strikes. Snow falling on the mountain slopes below the timber line seldom lasts more than ā few days. Very little timber grows below the lower limit of the snow, which blankets the mountains of the Death Valley ranges throughout the winter months. The snow blanket moistens the soil and stores enough water to meet the demands of the trees during the hot summer months. Mountains such as the Funerals, which carry no snow in the winter, support no growth of timber.

Tin Mountain and Telescope Peak in the Panamint Range and Grapevine Peak and Wahguye Peak in the Grapevines are clothed with open forests of stunted trees. In these high forests are the Utah Juniper, *Juniperus utahensis,* which is commonly called a cedar, the Nut Pine, *Pinus monophylla,* the Bristlecone Pine, *Pinus aristate,* and the Limber Pine, *P. flexis.* The high Panamints also bear the Mountain-mahogany, *Cercocarpus ledifolius.*

The nut pine, the only pine distinctly belonging to the Great Basin, occupies the summits of the desert ranges in company with the Utah juniper. Known also as the piñon pine, the nut pine reaches heights of forty or fifty feet, with a trunk twenty inches in diameter. The trunk is usually short, with a dark brown bark. The needles are a pale blue-green. The cones are short and open. The nuts of the nut pine furnished a very important food to the desert Indians.

The increased moisture and the generally improved physical character of the soil of the high slopes of the Panamint and Grapevine Mountains are favorable to the growth of a number

of bushes, which thrive in scattered clumps among the pines and junipers. Green foliage and handsome flowers are found on the Lemonade Sumac, *Rhus trilobata,* the Antelope-brush, *Kunzia tridentata,* the Wax Currant, *Ribes cereum,* the Cliffrose, *Cowania mexicana,* the sagebrush, the desert almond, and the joint-fir.

About the living springs and streams of Death Valley luxuriant groups of plants bloom in well watered shelter and accentuate the contrast of their location with the harsh, open desert and the rugged slopes upon which the hardier, true desert species survive sun and drought. Close to the water in the desert gorges the handsome cottonwood thrives. The slender, shrub-like Sandbar Willow, *Salix longfolia,* grows in thickets twelve feet high, and the tall Black Willow, *Salix nigra,* spreads its yellow twigs and bright green leaves. There are abundant perennials such as Indian Hemp, *Apocynum cannabinum,* the Waterparsnip, *Berula erecta,* the Rush, *Juncus balticus,* the Spike-rush, *Eleocharis rostellata,* the Bulrushes, *Scirpus olneyi, S. americanus,* the Tule, *Scirpus acutus,* and the Narrowleaf Cattail, *Typha angustifolia.*

In direct contrast to the luxuriant growths near the water sources in Death Valley, there are the sun-scorched faces of some of the alluvial slopes, where there is no sign of vegetation. Most of the gravel fans support a scattered plant life and although the growth is never heavy enough to obscure the surface of the wash it is often thick enough to cloud wide areas with color, when the spring brings the plants into bloom. Certain of the gravel washes, however, are without plant life of any description, and these are the washes on which the small stones glitter with the dark desert varnish. One of the slopes is near the mouth of Furnace Creek Cañon and another is on the east side of Tucki Mountain, close to the Cornfield. The

Photo by Walter Fiss

MESQUITE AND CREOSOTE-BUSH IN THE DUNES OF LOST VALLEY

soil on these slopes is a mixed gravel, clay, and sand; the same matrix which supports a varied flora in other parts of the valley. These slopes have lain undisturbed for many thousands of years and their surfaces are covered with small water-worn stones which have accumulated on the ground by the very gradual erosion of the clay matrix under the action of rain and runoff. The upper surfaces of the stones are a dark brown and black, with the luster of a hard-burned brick. This coloration is bioxide of manganese and is the result of oxidation under prolonged exposure to intense light. In the areas marked by these glittering stones the soil is just as good, and holds just as much moisture as in other regions in the valley where vegetation is well rooted, so that the entire absence of vegetation from these sunburned slopes is explained only by the presence of intense heat.

Science has satisfied itself by experiments that active protoplasm ceases to carry on its functions when it is subjected to a heat of one hundred and twenty-two degrees Fahrenheit. At that temperature the protoplasm disintegrates and dies. Plants, however, do grow in atmospheric temperatures in excess of the one hundred and twenty-two degrees, which the protoplasm is not able to survive because the plants themselves do not attain the temperature of the air about them. Desert plants are insulated from the high temperature of the air by the nonconductive character of their own specialized structure, and they reduce their actual temperature by the evaporation of moisture which accompanies transpiration. The barren slopes of gravel in Death Valley indicate that there is a limit to the amount of heat in which the most hardy desert vegetation can live, but the exact degree of heat is not known. The schoolboy fact that the spores of certain fungi retain their vitality even after exposure to a temperature of two hundred and

twelve degrees Fahrenheit indicates exactly nothing of the higher temperatures any desert plant can be expected to endure. The protoplasm of the fungus spore, which lives after exposure to the boiling temperature, is not active protoplasm, but that of a germinating or growing plant is active protoplasm.

The Weather Bureau tables record a temperature of one hundred and thirty-five degrees Fahrenheit at Furnace Creek Ranch. This reading was obtained at the one oasis in Death Valley and was the temperature of air sheltered from the effects of radiation. The temperature of the air in the open valley exposed to the extreme conditions of radiation must be somewhat higher than the recorded temperature, and the heat of the surface of the baking ground must exceed that of the air. If the principles of molecular physics mean anything, the actual temperature of the black varnished stones must reach an even higher degree and be as high as one hundred and forty-five or one hundred and fifty degrees Fahrenheit. That is a temperature in which no growing plant could be expected to live. In Death Valley none of the plants do.

Throughout most of the year the vegetation of the valley is a gray or brown color, which blends with the shades of the sand and rocks. As spring comes on in the latter part of March, the shrubs and plants seem to suddenly and miraculously increase their numbers as the touch of green illuminates their foliage against the dun background which formerly absorbed the colors of the plants. The green leaps from bush to bush as the days go by until the flats, the gravel wash, the rocky mountains and high mesas, are streaked and carpeted with green. Early in April the desert blooms with the flashing colors of its flowers. Mesa lands become fields of gold and white and lilac. Gray cañons are splashed with living green and coral. Soft flowers dress the ugly scars in the

hills. For a few short weeks the plant life of the valley smiles bravely in its flowering beauty. The valley revels in the colors of its blooms. Soon, summer will be here.

In the summer months the least popular residents of the valley have the valley almost to themselves. The snakes and the lizards come out to enjoy the warmth. Two rattlesnakes are at home in Death Valley in the summer. The big tiger rattler lives among the rocks in the hills and rarely comes down upon the valley floor to visit the horned rattlesnake, or sidewinder. The mottled tiger is decidedly more fearsome in appearance, but like all big rattlers is relatively slow. Relatively slow. I know of nothing as sudden as an unexpected rattlesnake. The sidewinder is small, fast and dangerous. Dangerous because of his tiny size, his speed, his protective coloration and his combative disposition. The sidewinder is seldom over eighteen inches long and is almost the same color as the soil he whips himself across in the swift, sidewise motion which gives him his name. The sidewinder is not guaranteed to rattle.

Six species of lizards live in the lower regions of Death Valley. The leopard lizard and the whiptail lizard and the gridiron-tail lizard are numerous in the sand and gravel of the torrid open desert. The whiptail and the gridiron-tail lizards move so swiftly when they are alarmed that the eye cannot follow their passage across the ground. The leopard lizard is ferocious and greedy, eating the desert vegetation and devouring the smaller lizards and the horned toad, which live in the same arid region. A tiny brown-shouldered lizard frequently becomes a victim to the unreasonable appetite of the leopard lizard. The ancient saurians are represented in the valley by the strict vegetarian *Dipsosaurus dorsalis.*

The chuckwalla is the second largest lizard of the American

deserts, as only the Gila monster exceeds it in size. The chuckwalla is present in numbers in the valley. The road crews extending the highways through the valley unearthed so many chuckwallas from the gravel washes on the Panamint Range that several of the road camps came to be called Chuckwalla Flat. The chuckwallas were startled at first by the snorting caterpillar and the clattering road machinery. Later the grave chuckwallas sat on the lava rocks by the raw gash of the new road and watched the road work go forward. In earlier years the chuckwalla was a popular food of the Panamint Indians. Some of the men in the road gang knew that. Others did not. The stew was tender and tasty, but two men quit their jobs on the road crew when they discovered that the cook was feeding them some of them damn lizards.

The ringnecked lizard prefers the higher mountain sides and the upper cañons and remains up among the rocks where the sagebrush, nut pine and junipers grow.

The varmints of Death Valley are the familiar coyote, a small fox, the western cat, and the bob-cat. The coyote holds sing-songs on the valley floor and the western cat ranges down out of the hills on quiet visits to the valley. The bob-cat stays well up in the mountains. The mountain sheep is in the highlands, although he is frequently met in the cañons near springs in the Cottonwood and Grapevine Mountains. The deer in the Panamints belong in the Sierra Nevada Range to westward and come over into the Death Valley country only when an excessive snowfall has starved them out of their home ranges.

The smaller hills and the sand dunes in the valley are crowded with the burrows of a myriad of small rats and mice and the lace of their tiny trails is spread all over the sand dunes. The valley does not boast of its one hundred and fifty varieties of insects. This total of insect species includes flies, ants, mos-

quitoes, spiders, grasshoppers, crickets, butterflies, bees, moths, beetles, the scorpion and plain bugs. A few of the flies, ants, and spiders are real nuisances. And the scorpion. The scorpion looks like a tiny lobster. He is from one to three inches long, with the lobster's large nippers before him and a very deadly apparatus behind him. His elongated body ends in a sharp stinger connected to a poison gland and he asserts his presence by curling the after end of his body upward like a tail and inflicts a poisoned and painful wound. The scorpion likes the dark places under rocks, or between stones and in cracks. He is unfriendly. He does not like people to paw through his chosen crevice. No one sits on him long enough to enjoy the view.

A variety of birds live in Death Valley and many of the migratory birds stop over in the valley on their flights to north or south. Some of the birds live in the valley ranges and are frequent visitors to the lower levels of the mountains. Ducks come in to the water at Saratoga Springs, Resting Springs, and Furnace Creek in February and March. They do not stay long. Only the water attracts them. I have seen small ducks tired from long flights across the desert uncertainly circling a group of buildings in the desert, to which they had been attracted by a fresh coat of green roof pain. The greenwing and cinnamon teal, the redhead, the mallard, and the ruddy duck have been shot in Death Valley. A few geese and canvasback ducks fly over the valley, but they seldom light. Marshy land close to the few large springs attract some of the marsh birds and waders. Coots are common about Saratoga Springs, and the killdeer plover visits Furnace Creek in numbers during the winter months. The marsh hawk and prairie falcon are almost always present at Furnace Creek and Resting Springs when the other birds are there in any numbers.

Three varieties of quail make their homes in the valley and its adjoining mountains. Several large coveys of Gambel's quail scuttle through the brush around Furnace Creek Ranch. Valley quail and plumed quail are plentiful in the watered upland valleys of the Panamint range, but neither specie gets east across the barren barrier of the valley. The mourning dove lives close to the mountain springs and streams, frequented by the quail in the Panamints.

The road-runner or chaparral cock is a resident of the valley, who stays close to the sand dunes and heavy growths of mesquite. The intermediate sparrow winters in the mesquite thickets, and other members of the sparrow family are scattered throughout the valley. Brewer's sparrow breeds in the sagebrush in the mountains, where the sage sparrow and the mountain song sparrow are also at home. The black-throated sparrow breeds prolifically along the lower edges of the mountains.

In the spring flights of feathered visitors increase the life of the valley. The ash-throated flycatcher, Say's phœbe, the long-tailed chat, the titlark, the mountain bluebird and poor-will fly about the valley in the spring. The red-winged blackbird and the house finch are excellent guides to water. During the spring period of bloom, Costa's hummingbird spends busy days at the flowers on the lower slopes. Warm spring nights bring the Western and Texas nighthawks into flight just after sundown.

The cañons of the mountains shelter the cañon wren, the lazuli bunting, and the Western horned owl. The rock wren prefers the bare rocks of the mountains and its nests are found at any altitude from sea level upward. The greatest number of the songsters are at home in the upland valleys, where they are cheered by the increased moisture and the colors and taste

Photo by Pacific Coast Borax Company

FURNACE CREEK RANCH ON THE DEATH VALLEY FLOOR. THERE'S AN OLD SWIMMING HOLE IN THE CENTER FOREGROUND

of butterflies. The higher valleys have many summer residents, including the red-shafted flicker, the violet-green swallow, the rough-winged swallow, and the white-throated swift. The mountain bluebird, the cactus wren, Le Conte's thrasher, the sage thrasher, Macgillivray's warbler and the white-rumped shrike live in the uplands. The woodhouse jay stays among the pines and junipers.

The Western red-tailed hawk and the raven are at home all through the Death Valley region. The turkey vulture is only occasionally seen.

Once in a great while the uppermost peak of the Panamint or Grapevine Mountains becomes the home of a pair of golden eagles. They are very rare and their arrival is an event. A few of the Indians and prospectors are trophy hunters. They climb the mountain peak to the nest of the golden eagles. I would like to see a golden eagle at his nest. I would like to sit beside his nest with a gun and await the arrival of the trophy hunter. I have never seen a trophy hunter mounted. I wonder if the moths would eat him.

GEOLOGICALLY SPEAKING

Jack Stewart and Bill Corcoran had visitors at their prospect hole up on Tucki Mountain. Two girls had made the long climb up two miles of mountain to the mine. They came two miles up to see the gold. Jack and Bill stopped mucking. The girls were tired from their climb, but not too tired to help the miners crack rocks, looking for gold. Cora had better luck than the others. Jack said, "You're a regular prospector. Now, me, I never can find a gold specimen to show anyone."

Cora was whacking ore chunks with a prospector's hammer. She asked, "This is quartzite, isn't it? Which quartzite is it?"

"It's a good quartzite," said Jack. "The miners call it bug-hole quartz on account of those holes that run through it like the bugs had been eaten it. See, there's gold. You got a lot of gold in that piece. I don't know what the geologists call this rock. Geologists has names they call things. They got a name for every rock. Some of 'em is surprisen names. And these geologists know a lot about rocks. Yeah, they do. They can tell you all about a rock. But do geologists ever find any gold mines? They do not. And do you know, even if you don't know the names of the rocks, finden the gold is kinda important."

CHAPTER SEVEN

GEOLOGICALLY SPEAKING

ACCORDING to the geologist, Death Valley had not assumed its present form in early and middle Miocene time. In the geologic epoch, between nineteen million and fifteen million years ago, the Panamint and Amargosa Ranges were low, and their southern portions were covered by a lake that had its shores somewhere south of Salt Creek in the present Death Valley. In the following thirteen million years the Panamint and Amargosa Ranges were lifted up, and in late Pliocene time, three and one-half million years ago, Death Valley was a closed basin occupied by a sheet of water, which varied widely in extent and crept up and down the ranges. The inwash of material from the mountains raised the center of the valley hundreds of feet above its present level. Alluvial slopes like the fan-shaped, gravel washes of to-day ran up the flanks of the Panamint and Amargosa Ranges. From time to time the lake in Death Valley evaporated and, in the playa that remained after each evaporation, great thicknesses of clay were deposited by the floods from the hills. During periods of unusual dessication in the hills, the floods carried down limestone and gypsum, which were precipitated upon the valley floor. Violent floods occasionally spread thin layers of boulders over the playa. The gradual formation of the playa deposits were accompanied by volcanic activity and basalt outflows.

The geologist has concluded that Death Valley was roughly blocked out in early Pliocene or late Miocene time, some seven

to eleven million years ago, through deformation including faulting and folding. Forces, tremendous beyond all reckoning, were at work shaping the topography of the Death Valley region, folding the ranges, lifting up vast areas of rock, thousands of feet thick, until the rock structure, lacking the strength to support its own weight, sheered along the fault lines which are visible to-day, and dropped whole counties downward in great blocks.

Death Valley appears to be one of these blocks dropped down between the Panamint and Amargosa Ranges by faults. The earliest structural lines from which the age of the valley may be judged are from eleven to fourteen million years old, as they are assigned to late Miocene age. These faults trend northwest and southeast and include a pronounced fault on the northeast side of the lake beds which were lifted up with the Funeral Mountains, and the normal faults of the Panamint Range. In late Pliocene times, seven million years after the great faults occurred, there was another disturbance. The lines of this later disturbance were west of north and the disturbance caused normal faults with a strike parallel to the axis of the valley. The faults are visible in the older alluvium, east of Stovepipe Well. The fronts of the Panamint and Amargosa Ranges facing Death Valley are very steep and are probably due to the erosional shifting of a fault scarp. The intense dissection of the prebasaltic mature terrain of both mountain ranges gives every indication that the drainage lines flowing into Death Valley have been revived in late geologic time.

No pre-Cambrian formations have been found in the Death Valley region, but the fact that some of the quartzites in near-by ranges contain pebbles derived partly from sedimentary rocks, and partly from granite, leads to the conclusion that pre-Cambrian rocks, both sedimentary and igneous, covered southwestern Nevada and eastern California six hundred million

Photo by Walter Fiss

GROTTO CAÑON IN TUCKI MOUNTAIN

years ago. During the succeeding two hundred and fifty million years—in Cambrian and Ordovician times—the Death Valley part of the Great Basin was part of a sea bottom, upon which sandstones, limestones, and finally more sandstones were laid down. The sea bottom sank step by step as these sediments were deposited. The eastern border of the land mass, from which these sediments were derived, has been located approximately as the present Sierra Nevada Range. In the southern reaches of the sea, the shore line swung further west.

The early Paleozoic rocks of the valley region contain a great proportion of sandy sediments and rather impure limestones, indications of the close proximity of the region to the continental shore line, as it was located four hundred million years ago. Ripple marks, cross-bedding, and the presence of certain forms of conglomerates and limestones suggest that the sea was shallow most of the time, and sun cracks indicate that the deposits were even raised above the level of the sea in certain localities. The ancient shore line was naturally subject to great forces of uplift, so that the presence of islands is not at all unlikely.

The geologist has discovered a number of details in each stage of Death Valley's development, and although the interpretations of some of the structures within the valley are still open to question, the major features of the valley and of the mountains on each side delineate the broader phases of the region's geologic history.

The Amargosa Range

The Amargosa Range, consisting of the Grapevine, Funeral and Black Mountains, on the eastern side of Death Valley, has been subjected to two main periods of folding and uplift. The first period was in pre-Tertiary and post-Jurassic time, about

one hundred and twenty-five million years ago. The second period was in late Miocene time, some eleven or twelve million years ago. In the northern part of the Amargosa Range the second period was somewhat earlier than in the southern part, and appears to have occurred after the outflow of the earlier rhyolite. North of Wahguyhe Peak, in the Grapevine Mountains, the Paleozoic rocks and the earlier rhyolite are so folded together that it is difficult to differentiate the two periods. Even here, however, it is evident that the Paleozoic rocks were subjected to more profound folding. Both reversed and normal faulting accompanied the first folding, but the second folding stage brought only normal faults. Before the second folding period began the range had been worn down to an inconspicuous ridge and the eastern slope and the whole southern end of the range was on the bottom of a Miocene lake. The Amargosa Range owes its present height to the last folding stage and to the uplift of land masses which followed.

Early Paleozoic rocks are widely distributed throughout the Amargosa Range. Quartzites are intercalated with schists and marble. The quartzites are white, pink or gray, except where hematite or clay cement changes the color to black. Impure quartzites grade into shale and schists. The shales are fine-grained plates, green or dark gray in color and from one-sixteenth to one-half inch thick. In the schist there are deep-red garnets, light-green plates of ottrelite, the green-gray, micaceous chlorite, and the gray prisms of andalusite. Small crystals of tourmaline cut the schistosity in most of its thin sections.

North of Boundary Cañon, the Grapevine Mountains contain a great deal of granite. The interbedded marbles are fine and medium grained, dense rocks of buff, pink, purple, gray, or white. Much of the marble is in thin sheets. At Poison Spring

thin sheets form a fine mosaic of quartz and feldspar, and green-black hornblende or red garnet interbeds with the schist and sends short arms into it. At Chloride Cliff a sheet of hornblende schist cuts across the bedding planes of marble and schist. This sheet is two hundred feet thick and a quarter of a mile long. This schist and its accompanying gneiss are probably mashed, basic igneous rock and are among the oldest rocks known in Death Valley. The hornblende rocks are older than the massive structures of post-Jurassic granite and probably date back through over two hundred million years to Paleozoic time.

The sedimentary rocks of this early series were deposited in a shallow sea under constantly and rapidly changing conditions. The entire series of rock is identical with that of Tucki Mountain across the deep gash of Death Valley.

Fossiliferous limestone of Ordovician age extends from Keane Springs in Boundary Cañon northwestward to Grapevine Cañon. In a large area north of Keane Spring this four hundred million year old limestone is from two thousand feet to three thousand feet thick. It is light to dark gray or black in color. In Titus Cañon it is blotched by areas of coarse, white calcite. In Boundary Cañon this limestone is overlaid by eight hundred feet of pink Ordovician quartzite. Interbedded with this pink quartzite are thin layers of black, fine-grained quartzite and layers of olive-green or brown slaty shales. Above the quartzite in Boundary Cañon there is three hundred feet of Silurian limestone. It is a fine-grained, dark-gray limestone and holds small beds of black flint, white or pink quartzite, and limy shales.

Conglomerate rocks occur in a number of areas in the Amargosa Range. The rocks vary from loosely to strongly consolidated material, and range in color from green to red and

yellow to brown. The pebbles, which reach a maximum diameter of four inches, are well rounded and often bear a high polish. Derived principally from Paleozoic rocks, with some granite and Eocene rhyolite pebbles, they give every indication of having been part of the shore deposit of a lake upon which the waves swept with considerable force. The pebbles are therefore assigned to Miocene time contemporaneous with the lake which occupied Death Valley at that time.

The fifty million year old rhyolite of the Eocene epoch forms the crest and eastern slope of the Amargosa Range for some distance on either side of Boundary Cañon. There are several well defined flows. The rhyolite flows of lilac, white or pink, are more abundant than the colorless or smoky quartz, or the glassy feldspar with which they are associated. Four miles southeast of Wahguyhe Peak, in the Grapevine Mountains, the rhyolite is a faded brick-red rock banded with pink lines. Exfoliation breaks the rock into innumerable small plates. Much of the rhyolite that is now white or light gray was formerly a brick-red. Kaolinization has occurred along the cracks in the rock and formed many striking patterns in reds and white. Sandy tuffs of red, white, and green-white rhyolite are interbedded with the lavas.

This Eocene rhyolite of the Amargosa Range occurs in flows which are from ten feet to three hundred feet thick. The flows lie one upon the other and impart a varicolored banding to the range. The entire rhyolite series is about three thousand feet thick. Most of it outflowed as lava, but some of it was deposited in sheets of water. The rhyolite series lies upon the eroded surface of the Paleozoic rocks.

Early Pleistocene basalt is found in the rhyolite flows and breccias, and also interbedded with rhyolite. Mining

operations have revealed beds of basalt fifty feet thick between the Ordovician limestone and the Eocene rhyolite.

The later rhyolites of the Amargosa Range are geologically young. They are about five or six million years old and belong to the Pliocene epoch. They are semi-transparent to opaque, with visible crystals of quartz, feldspar, and biotite. In color they range from light-gray through red to black. Flow breccias are common and in many places the rock has disintegrated into pebble-like masses. At some points the upper portion of the rhyolite is interbedded with basalt flows. At other localities the basalt cuts through the Pliocene lake deposits and the Pliocene rhyolite.

Basalt is the youngest of the igneous rocks. Its flows cover a large area at the north end of the Amargosa Range, and a number of smaller areas are found on either side of Grapevine Cañon. This basalt is almost all black and dense. Only occasionally is the basal portion red. Southeast of Daylight Springs the rhyolite hills are capped with remnants of the basalt flows. The basalt at the south end of the Amargosa Range overlies the conglomerates of the early Pliocene lake beds and is considered to be of Pliocene-Pleistocene age. The Grapevine Cañon basalt is younger and is assigned to late Pliocene or early Pleistocene time.

The Amargosa Range, as a whole, is a unit, but there is a natural division on physiographic and geographic grounds at Furnace Creek. At Furnace Creek the Funeral Mountains front the Black Mountains with a south scarp that is six thousand feet high and so steep that it is almost unscalable. At Furnace Creek the range swings more to the south and the older rocks of the Grapevine and Funeral Mountains are replaced by the Tertiary sedimentary rocks of the Black Mountains.

The Grapevine, Funeral and Black Mountains all present

steep somber sides to Death Valley, rising to heights of five or seven thousand feet above the valley. The high narrow Funeral and Grapevine Mountains culminate in Grapevine Peak, eight thousand five hundred feet above sea level. Southeast of Grapevine Peak, Wahguye Peak lifts a splendid truncated cone to the sky. The Death Valley side of the Amargosa Range is deeply cut by drainage channels and set with numerous rugged peaks and pinnacles. The stream channels are deep cañons, often three thousand feet deep below the ridges on either side. The stream bed of Titus Cañon is only forty feet wide. The cañon walls are sheer for two hundred feet and then rise at an acute angle to the mountain crest two thousand feet above. These cañon walls are water polished to a height of forty feet and cloudbursts have lodged boulders fifty feet above the bed. The smoother expanses of the stream gradient are separated in many cañons by walls of resistant rock strata, which form dry falls from ten to one hundred feet high.

The eastern side of the Amargosa Range, south of Chloride Cliff, is topographically older than the rest of the Range, as it is composed of land surface correlated with similar tracts in the Panamint Range on the west side of the valley and with other ranges within the Great Basin. These older parts of the range are identified by their dome-like mountains, shallow and gently sloping valleys, deep soil and comparatively few and inconspicuous rock exposures. One smaller portion of this older topography in the northern part of Grapevine Mountain is surrounded by deep-cut cañons, and the drainage lines pass precipitously from the mature uplands to the young gulches. This mature land surface, which at one time extended over the entire mountain range, is now preserved only where it is advantageously situated. Since it forms the eastern slope of the range south of Chloride Cliff, and is not present on the Death

Valley side of the range, the geologist infers that the grade of the streams on the valley side has been greatly increased by the comparatively recent depression of Death Valley. This depression probably occurred in early Pleistocene time, because a similar surface in the Panamint Range was developed prior to the outflow of basalt in late Pliocene or early Pleistocene time.

The Panamint Range

The Panamint Range on the western side of Death Valley is one hundred and thirty miles long and trends north-northwest, parallel to the Sierra Nevada Range. The structural history of the Panamints is as complex as that of the Amargosa Range. Miocene formations do not appear in the Panamints, and therefore there is no means by which pre-Tertiary and middle Tertiary folding can be differentiated. It is evident, however, that the Paleozoic rocks of the Panamints were folded prior to the intrusion of the post-Jurassic igneous rocks.

Tucki Mountain is formed of metamorphosed sediments identified with the pre-Cambrian quartzites found in the Amargosa Range. Tucki Mountain pitches sharply upward to the north, and its western side is either buried in the rubble of Emigrant Wash or faulted off. The Cambrian rocks clearly show the folding suffered. The schist is closely folded and even crenulated. The limestone bands are less strongly folded, and the folds of the quartzite are open. The complex folding of the limestones is less intense than that in the Amargosa Range. The earlier folding was accompanied by reverse strike faulting, and the limestones were further disturbed at a later period by the intrusion of quartz-monzonite, which buckled and faulted the limestone at the contact. Displacements of several thousand feet are evident. Small normal faults occur throughout the

Pennsylvania limestone near the valley, and presumably formed when Death Valley originated.

Lava mesas unite the northern end of the Panamint Range with the Amargosa Range. The southern end of the Panamints passes into low hills of Tertiary sediments and lavas, capped with later basic volcanic rock. The ascent of the Panamint Range from Death Valley is from six to eleven thousand feet, and the profile of the range from Panamint and Termination Valleys on the west is equally great. The range ends thirty miles south of Tucki Mountain in Telescope Peak, which is eleven thousand and forty-five feet high. Twenty-five miles north of Tucki Mountain is Tin Mountain, eight thousand, nine hundred feet high, the highest point of the northern end of the range. The crest of the range is west of its center, and the western descent is a series of cliffs and steep slopes. The entire range is scored by deep cañons, many of them comparable in beauty with famous, better known gorges. The sharply curving floor of Marble Cañon is only ten feet wide and is overhung by walls two hundred feet high. Many reaches of the cañon are in perpetual shadow. The cañon walls are beautifully smoothed and rounded by erosion for seventy-five feet above the cañon floor. These polished walls are slashed into bizarre patterns by the brilliant yellows, reds, whites, and blacks of the limestones. The gentler gradients of the gravel stream bed are broken by rock cliffs with heights up to one hundred feet.

The most widely distributed formation of the Panamint Range is the Pogonip limestone. About three thousand feet of this compact, fine-grained Ordivician limestone are exposed. In color, it ranges from dark gray to black. The dark color is partly due to carbonaceous matter. Some of the limestone beds are so fetid that the rock exudes a tarry substance when it is heated. The bedding of the structure is massive, with some

Photo by Stephen H. Willard

ALONG THE ROAD THROUGH FURNACE CREEK CAÑON

thin-bedded, slightly argillaceous facies. Cross bedding occurs in several places. Layers and lenses of black, semi-translucent flint, from one-half inch to three inches thick, and separated by limestone bands from one to three inches thick, occur near the top of the Ordovician limestone formation. In other of the limestone beds, concretions of globular and ellipsoidal flint are abundant. Rugged exposures of white or pink, fine-grained, quartzite outcrop on the west side of the Panamint Range, north of Goldbelt Spring.

On Tin Mountain the Pogonip limestone holds fragmentary and imperfect fossils of Ordovician age. South of Tin Mountain a band of muscovite schist thirty feet thick is interbedded with the Pogonip limestone. The abundance of organic remains, and the presence of cross bedding lead to the conclusion that the limestone was deposited in shallow water. The great uniformity and thickness of the limestone indicates that the sea bottom was depressed, step by step, as the limy sediments accumulated. This Pogonip limestone is the same formation present in the other ranges of the Death Valley region.

The Death Valley side of the Panamint Range bears a narrow band of Pennsylvania limestone which is separated from the Pogonip limestone to the west by a fault of several thousand feet displacement. About fifteen hundred feet of the Pennsylvania limestone is exposed. It is fine-grained and gray or dark gray in color. The darker stone gives off a fetid odor when it is struck with a hammer. Like the earlier Pogonip limestone, some of the Pennsylvania structure contains lenses and ellipsoidal masses of black flint. A few fragmentary fossils of Carboniferous age have been recovered from the Pennsylvania limestone.

On the southwestern flank of the Panamint Range small

fragments of the fine-grained, gray, igneous quartz-monzonite are found. About seventy-five square miles of the southwestern portion of the range are underlain by a batholith of quartz-monzonite. This structure, which resembles both granite and diorite, is of the post-Jurassic epoch and is similar in composition to mineralogic structures in the Sierra Nevada Range, fifty miles to westward. The granular formation is a light or medium shade of gray and is occasionally tinted with pink. Throughout the quartz-monzonite appear a gray feldspar, a decided pink feldspar, the green-black of pyroxene, the bronze-brown biotite, and here and there, a patch of magnetite and seal-brown titanite. The quartz-monzonite pierces the Pogonip limestone of early Devonian age and is itself cut by pre-Tertiary diorite porphyry. Where the monzonite batholith sends thin dikes into the Pogonip limestone, the limestone is considerably disturbed at the point of contact and dips sharply, usually in a direction away from the monzonite. Small limestone formations enclosed by the monzonite appear to have been borne upon the surface by the molten rock.

Fourteen miles northwest of Tucki Mountain there is an irregular mass of soda syenite and soda syenite porphyry. This mass, rich in soda, sends many dikes and ramifying veins into the Pennsylvania limestone. It is likely that the limestone at one time covered the syenite, but erosion has swept the limestone away. The syenite is coarse to medium grained in form. Its granularity and its mineral content vary greatly according to its location. The finest grained rock is next to the limestone. In its predominant form the soda syenite is gray and embodies pink feldspar, green-black pyrozene and black mica. Greenish-gray dikes of the finely grained siliceous aplite cut the soda syenite. The only veins in the syenite formation are those of pink and gray feldspar and green-black pyrozene.

The limestone immediately adjoining the igneous mass of syenite has been metamorphosed to white marble.

At intervals along the Panamint Range the mountain structure is capped with small masses of late Pliocene and early Pleistocene age. The basalt is about five hundred feet thick, a dense dark gray mottled by small light-gray areas. A short distance up Cottonwood Cañon from Death Valley an outcrop of this basalt cuts into the exposed Pennsylvania limestone. On the east side of Emigrant Wash a basalt flow forms a dense black sheet along the road through Townsend Pass.

The basalt deposits in Cottonwood Cañon and in Emigrant Wash both lie beneath the older deposits of alluvium. Other basalt flows, notably those at the northern end of the Panamint Range and those near Emigrant Spring are interbedded with the older alluvium. Here is clear evidence that the older alluvium and the basalt were first contemporaneous and that the basalt flows continued after the depositing of the older alluvium was completed.

As in the uplands of the Amargosa Range, the crest of the Panamints is of older, more mature topography with well-graded stream channels and gently rounded peaks and slopes. The crest belt is from one to three miles wide. Remnants of the older alluvium have survived in favorable locations on the mountain slopes above five thousand feet. In the southern part of the range these deposits of the older alluvium are covered with basalt, an indication that the alluvium was developed in Pliocene time. There are a number of these areas of older alluvium on each side of Emigrant Wash. The deposits to the east of Emigrant Wash form intensely dissected hills, which are continuations of Tucki Mountain. A few small outcrops of this alluvium occur in the mountain at a maximum altitude of five thousand feet. The deposits are composed of beds of angu-

lar boulders which are well cemented by calcium carbonate. Around Emigrant Springs and at the north end of the Panamints, white and pink clays (similar to the present playa deposits on the valley floor) are interbedded with the boulder beds. The northern deposit of clay and alluvium is twenty-five hundred feet thick.

The older alluvium beds lie upon the eroded surface of the quartz-monzonite and Paleozoic rocks. Imposed upon the older alluvium are recent desert gravels. In Pliocene-Pleistocene time, when Death Valley was occupied by an extensive playa, the Panamint Range must have been rather low and insignificant, because the alluvium deposits of to-day are the remnants of the old alluvial slopes that once fringed its borders. Near Goldbelt Spring at the head of Marble Cañon these old alluvial slopes or washes reached an elevation of five thousand feet. At Tin Mountain remnants of the washes remain in the mountain above four thousand feet. Large portions of the Tucki and Tin Mountain deposits are old playa clays.

Death Valley

A comparison of the general geologic features of Death Valley with the structure of the Amargosa and Panamint Ranges leaves only a few gaps in the history of the valley's formation. Two sedimentary series, which are much younger than the Paleozoic rocks of the Amargosa and Panamint Ranges, outcrop in Death Valley. One of these deposits is composed of coarse, fragmental material which is so well-rounded that it must have been deposited in a wave swept lake. The second deposit is angular or subangular playa material and is obviously a product of erosion. Both deposits contain some of the finer clays and limestones. The clay and limestone deposits associated with the well-rounded fragments of the first sediments are better

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SUNSET OVER THE PANAMINT RANGE. DEATH VALLEY IS ONE MILE BELOW THE CAMERA

cemented, considerably more deformed, and clearly older than the material of the playa deposits. These same two formations are found on the east side of the Amargosa Range and further east in adjoining portions of the Amargosa Desert, where the detrital and playa deposits are uncemented, angular gravels, clays, and chemically precipitated limestones, markedly undeformed, and the older lake beds are sandstones and well-rounded conglomerates. Near Ash Meadows, in the Amargosa Desert, there is evidence that the detrital deposits were laid down after the folding of the lake beds and their elevation to form the Funeral Mountains. Geologists do not agree upon the individual ages of the two beds. Nor can they decide upon the time interval between the two beds. Some assign the older lake beds to the Eocene epoch. Others, after examining portions of the Amargosa Range, believe that the older lake beds belong to the Miocene epoch, and the presence of basalt outflows contemporaneous with the younger alluvial beds convinces them that these younger beds were still being deposited in Pleistocene time. The difference of opinion is a matter of some thirty-five million years.

Thirty-five million years would represent quite a difference of opinion in fixing a date anywhere except in geologic time. To the geologist those thirty-five million years represent a scientific uncertainty whether the lake beds were deposited a week ago Monday or two weeks ago Monday. An early modern estimate of the age of the earth since the geologic record began placed the earth's age at forty-eight million three hundred and eighty thousand years (Williams, Schuchert, Salles and Matthew, between 1893 and 1910). In 1917 Joseph Barrell made calculations based upon radio activity and decided that the earth was one billion seven hundred and ten million years old. In 1928 Dr. Henry Russell advanced figures, placing the

age of the earth at more than fifteen hundred million years and less than four thousand million years, and in the same year Professor James Hopwood Jeans produced evidence that the earth was born between two thousand and five thousand million years ago.

Consideration of the estimates of the earth's age makes the thirty-five million years difference of opinion as to whether the old lake beds in Death Valley are fifty million or fifteen million years old appear trivial. When the geologists cannot agree upon the age of the younger beds of alluvium and are undecided whether they were deposited in Pliocene time, four million years ago, or in the Pleistocene epoch, one and one-quarter million years ago, I suspect them of quibbling.

On the east side of Death Valley a number of complex hills rise above the recent gravels. These hills are formed of the Tertiary lake beds and are a northwestern extension of the folded sediments which exist in the southern end of the Funeral Mountains and which are also found further to the southeast, beyond the mountains in the Amargosa Desert. These Tertiary lake beds consist of white, yellow, and green clays, friable sandstones with ironstone concretions, rounded and subangular gravels, and thin limestone lenses. Sun cracks and ripple marks in the clays indicate that the lake was shallow and at times even dry. The subangular gravels are proof that cloudbursts tore fragments from the mountains and spread the detrital deposits over the lake beds in sheets. Colemanite and other chemical precipitates now found in the old lake beds were laid down by the evaporation of the lake water.

The low hills of the valley contain other members of the lake bed series in the form of reddish-brown conglomerates and conglomeratic sandstones with rounded pebbles. The pebbles are usually less than three inches in diameter and are of

limestone, quartzite, and schist derived from the Amargosa Range. Hills of the older alluvium break the level floor of the valley and in places extend well up the Amargosa Range. Hillocks of slightly consolidated clay located in the sand waste north of Salt Creek indicate that the deposit once extended across the width of the valley. Hills of the same structure form the north end of the Panamint Range.

The road through the pass, which divides the Grapevine and Funeral Mountains, passes through a dessicated ridge which is from two hundred feet to four hundred feet high. The ridge is deeply cut by antecedent drainage lines. Next to the Amargosa Range, the hills are composed of beds of boulders and bands of gravel and sand. Well developed joints form buttresses on the main cliffs. Many of the higher cliffs are crowned with boulders. Within one-half mile of the valley edge of the hills, the sand beds give way to beds of clay and layers of the clay wedge in between the boulder beds. At the valley edge of the hills clay becomes the base of the series and the boulder beds are on top.

At Salt Creek the exposed beds include yellow, white, and green clays with an occasional thin bed of white limestone. At Triangle Spring the clays are interbedded with fine-grained, dirty-brown limestone, a compact gray limestone, and caramel-brown gypsum. Tawny-yellow clays and thin bands of limestone form a long ribbon near the Grapevine Mountains, northeast of Surveyors Well. Further north, at Grapevine Springs, the deposit is white or gray, porous limestone and fine clays. Northwest of Grapevine Springs near the middle of the valley the clay is interbedded with flows of Pleistocene basalt, and some of the clay layers contain boulders of the basalt. Some of the clay under the basalt has been baked red.

The original thickness of the old alluvium, which is part

of the Amargosa Range, is estimated at over three thousand feet. The deposits now exposed in the valley walls of the range are about twenty-five hundred feet thick and have been reduced to this depth by the constant erosional processes which continue to this day to wear down the mountains and fill up the sink of Death Valley.

The thickness of the gravels upon the valley floor and in the alluvial fans and slopes is unknown. The detrital deposits of the valley are made up of sand, pebbles, and boulders. Near the mountains the angular and subangular boulders reach a diameter of six feet. The boulders often bear marks received during their rapid descent from the mountains; those of quartzite showing small crescentric fractures, and the fine-grained limestones displaying white, crushed areas. The gravels near the mountains are only slightly stratified, and cross-bedding and erosional unconformities are common. The deposit at the valley edge of the alluvial fans grades into pebbles and sand and playa clays. The rocks of these detrital deposits have suffered no decomposition, and, if consolidated, would form secondary rocks similar to those from which they were derived.

The gravels are still accumulating upon the surface of the washes, but the process is a very slow one because of the infrequency of heavy rains, and because the alluvial washes all contain many divergent drainage channels cut deeply enough to carry off the water from the hills. The surface rocks and stones which cover the washes outside the drainage channels are scored by wind erosion and stained with desert varnish, produced by long exposure to the sun.

The low hills of Tertiary sediments separate the southern part of Death Valley with its great salt bed and long miles of alluvial waste from the smaller, northern arm of the valley. The salt bed is about thirty miles long and from two to four miles

wide. The lowest surveyed point in the United States lies over three hundred feet below sea level in this salt bed. The salt is coated brown with an accumulation of dust and sand, is mechanically impure, and also contains over three per cent of sulphur. A saline marsh extends through the salt bed to a point a few miles north of Furnace Creek.

The northern arm of Death Valley is called both Mesquite Flat and Lost Valley. It is occupied by an extensive playa and by large sand dunes. The playa deposit contains light-gray and fine, white clay, calcium carbonate, borate of lime, and complex loams and sands.

In spite of the structural complexity of the Death Valley region, the relative lack of any detailed geologic reconnaissance embracing the whole district, and the wide divergence of scientific opinion upon the age and chronology of any geologic formation, it is possible to present the succession of events which formed the Amargosa and Panamint Ranges and Death Valley. Beginning at Ash Meadows in the southeastern part of the region, the bolder features of widely separated areas have been traced northwestward across the Amargosa Range, down into Death Valley, up the eastern slopes of the Panamint Range and down the western flanks of the Panamints into Panamint Valley. The distribution, altitude and attitude of closely related or identical formations, which occur throughout this area, mark the steps in the succession of geologic events within the Death Valley region.

Some five hundred and fifty million years ago, when the earth was over one billion years old, the thick, conformable Paleozoic series of rock formation were laid down. This series is so complex in structure and so lacking in continuity that it cannot be traced as accurately as the younger formations. Derivities of the Paleozoic rocks are present, however, in the mica, schists,

and marble of the Prospect Mountain quartzite which is found in Tucki Mountain in the Panamint Range. The same derivitives are in the Grapevine Mountains northeast across Death Valley from Tucki Mountain. They are found in the Bullfrog Hills fifteen miles northeast of Boundary Cañon, and they exist in Quartzite Mountain sixty-five miles further away to the northeast of the Bullfrog Hills. The southern ends of both the Amargosa and Panamint Ranges terminate in Prospect Mountain quartzite. Some of the derivities of the Paleozoic rocks are considered to be of pre-Cambrian age, a time classification that adds another ninety million years to their age and moves them back through geologic times out of the Paleozoic era into the almost entirely unknown realm of the first eight hundred and fifty million years of the earth's calendar.

During the one hundred and fifty-five million years between the end of the Paleozoic era and the beginning of the Tertiary period, the Death Valley region was first elevated as a great land mass. The region suffered very little folding in the elevating stage. After it had been elevated the region was carved into sharp, lofty mountains with deep, wide valleys. The valleys held a chain of inland seas, or lakes. During the sixty million years of the Tertiary period a thick series of rocks was deposited in this chain of lakes. The conglomerates and breccias derived from the uplifted Paleozoic rocks in the surrounding mountains were deposited near the shores of the lakes. Other portions of the lakes received silts and gravels. While all these materials were being deposited in the lakes during Tertiary time, and especially while the late Tertiary deposits were being laid down, there was great volcanic activity in the neighboring ranges. Sheets of lava were poured into the lakes to become intercalated with the sedimentary beds.

The Death Valley lake existed through long ages. It

Photo by Walter Fiss

SHADOWS FLOOD THE SAND HOLLOWS

was usually a fresh water lake but at times its waters were so greatly reduced by evaporation that beds of salt, borax, silica, and lime were precipitated to mingle with the detrital silts in the lake bed.

In more recent time, outflows of olivine-basalt followed the first lava sheets which had gone into the lakes some fifty million years ago in Eocene time. The later basalt flows are now found with well stratified sediments, which would scarcely form anywhere except upon a lake bottom. In many places in the Death Valley region the brown and red conglomerates lie upon the yellow-green lake beds. The final flows of olivine-basalt two million years ago covered all the deposits which had been laid down in the preceding ages.

Earthquakes and other surface disturbances began before the Tertiary series of rocks was deposited. The disturbances continued throughout the Tertiary period and reached a peak of tremendous violence in late Tertiary time, about twelve million years ago. Hills, mountains, and ranges were raised and lowered, distorted and folded. The crust throughout the region was bent and twisted, broken and faulted. Death Valley was created, a vast sink dropped down by faults between the Amargosa and Panamint Ranges.

Erosion then began to take its toll from the mountains, producing many irregular forms in its efforts to wear down the uplifted rocks. In Miocene time, a lake several hundred feet deep formed in Death Valley and soon became heavily charged with salt, borax, niter, potash, and kindred minerals. All these minerals were derived from the leaching of the earlier lake beds which had been elevated into mountains and were washed by the relentless rains.

In early Pleistocene time the lake evaporated and left a salt desert. That was about two million years ago. Since that time

the climate has become drier. The torrential rains are gone. The conglomerates of the lake shore remain very much as they were a million years ago, only slightly disturbed by the erosive effect of the water draining from the mountains to the dry desert.

The geologic history of Death Valley is written boldly across the faces of its chained mountains. Dabblers in geology are confounded by the massive form of the structures which built the hills. To students of geology the valley is a great laboratory, in which their knowledge of geologic form is sternly tested. The true geologist rejoices in the naked revealment of structural composition and deformation within the bald guardian ranges of the valley.

A cavalcade of over thirty automobiles loaded with geologists passed through Death Valley. I did not press any visiting scientist for his interpretation of the valley, because the United States Geological Survey had already royally invited me to make free of the accumulated reports of its field-workers. The touring geologists passed over valley flat and hill, and through the cañons and mountain passes. They examined the great peaks, the titan carvings in the high rock buttresses, and the massive faults. They succinctly classified the valley and its ranges. They stripped all the clutter of science from their talk.

Looking at Death Valley and its hills, they said, "Magnificent!"

The Road Builder was on a holiday tour through the Middle West. In Hannibal, Missouri, he broke a ring he had been wearing for twenty years. He went into a jewelry store to get the ring fixed. He handed the ring to the jeweler. The jeweler looked at it. It was an odd looking ring. A plain gold setting held a green-blue stone carved into a bullfrog. The jeweler swallowed hard and shook the ring under the Road Builder's nose.

"Where," demanded the jeweler, "where did you get this ring?"

"Out west. Can you put a new band on it?"

"I asked you where you got this ring. I want to know where you got this ring!" The jeweler really wanted to know. He was excited about it.

"What's the idea? It's my ring. I didn't steal it."

The jeweler gurgled and vibrated and waved his arms. He said, "I don't care about that. Were you ever in Rhyolite, Nevada?"

"Sure," said the Road Builder. "Nineteen-five 'til nineteen-seven."

"My God!" said the jeweler. "I made this ring in Rhyolite in nineteen-seven. I made about twenty of these Bullfrog rings. Say! Wasn't Rhyolite some town! For twenty years I've been trying to forget the times I had in Rhyolite. And I just get them all forgotten and settled down with a nice business and you have to come in here with one of my Bullfrog rings! My God! Now I got to go back out to that country. I'll never be happy if I don't."

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